APPENDIX A

ENGINEERING REPORT

APPENDIX A.7

POTENTIAL EARLY INVESTMENTS

Sunnyside Yard Master Plan
February 27, 2020

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1.00 INTRODUCTION

1.01 Executive Summary

The intent of this memo is to outline the technical considerations in developing a preliminary design for the potential early public realm improvements. This memo is intended to be one component of an integrated design effort and should be considered in tandem with other deliverables produced at this time to meet the needs of the project.

Figure 1.1 - Potential Near Term Public Realm Improvements

The portions of the Master Plan included options, which are illustrated in Figure 1.1, include the following:

1. **A Civic Park Park** that provides recreation and civic space for Downtown Long Island City and serves as the front door to Sunnyside Station.
2. **A Linear Park along Skillman Avenue** that utilizes terra firma land on the southern edge of the Yard to create new open space and an improved bike connection from Lou Lodati Park to Thomson Avenue.
3. **Two Over-Yard Greenways** that create safer and more attractive pedestrian and bike connections along the Queens Boulevard and Thomson Avenue Bridges.

Areas intended for the overbuild as part of the near term public realm improvement options have been analyzed through fire hazard modeling as part of this preliminary design phase. Given the limits of construction of the near term public realm improvement options ventilation plants or distribution plenums will not be necessary. As future phases of the deck are constructed, the construction sequencing must consider the need to maintain natural ventilation of these public realm spaces and minimize any reliance on mechanical ventilation until the construction is near completion. Detailed thermodynamic and dispersion analysis has shown that non-mechanical (natural ventilation) process will provide sufficient management of train heat and other air quality impacts from diesel locomotives and maintenance operations.

Initial analysis determined that construction and support structures for the parks and greenways is likely to impact a number of the existing rail system infrastructure. Refer to Appendix A.7.B for more details. The design team addressed some of the more crucial impacts, based on the available information. However further work would need to be done to ensure that the deck and structures for the parks and greenways does not negatively interfere or impact rail infrastructure and operations.

As a general approach to the greenway deck design, every effort is made to maximize clearance between the tracks and columns, and wherever possible to meet or exceed the 16’-0 requirement. At this time the design is not at a level of detail to indicate any areas where the clearance cannot be met.

Constructing the greenway decks at the proposed heights would require reprofiling and transferring the OCS system. This will need to be accomplished in accordance with the requirements of maintaining operations on the railroad. Various other infrastructure elements throughout the yard would require modification and are outlined. None of the modification schemes are considered to be prohibitive to the implementation of these public realm options.

Loading assumptions for the public realm improvements differ from the baseline loading addressed in the Conceptual Deck Design report for potential future phases. In order to meet the project goals, a lighter load scenario was developed, and is indicated on drawing S-021 in Appendix A.7.G.

The conceptual structural design for the public realm improvement options is illustrated in the various drawings in Appendix A.7.G. In an effort to provide a structural deck scheme that is unique to each options loading scenario, a precast concrete "tub girder" design was developed.

A discussion of stormwater management is presented with an emphasis on potential flow rates, discharge schemes, and the impact of Climate Resiliency Design Guidelines adopted by the city. Conflcits between existing utilities and new structure within the existing railyard are unavoidable, but not expected to be prohibitive.

Fire and Life Safety considerations are outlined for the public realm improvement options. Recommendations for the next project phase are also outlined.

1. **A Civic Park Park** that provides recreation and civic space for Downtown Long Island City and serves as the front door to Sunnyside Station.
2. **A Linear Park along Skillman Avenue** that utilizes terra firma land on the southern edge of the Yard to create new open space and an improved bike connection from Lou Lodati Park to Thomson Avenue.
3. **Two Over-Yard Greenways** that create safer and more attractive pedestrian and bike connections along the Queens Boulevard and Thomson Avenue Bridges.

1.02 Project Overview

The Sunnyside Yard Master Planning initiative is led by New York City's Economic Development Corporation in consultation with Practice for Architecture and Urbanism and a multidisciplinary consultant team. The purpose of this plan is to develop a long-term Master Plan for an overbuild deck at the existing Sunnyside Yards site. As part of the directive of this master planning phase, the intent of this memo is to outline the technical considerations in developing a conceptual design for a network of parks and greenways, which could be the first portions of the project to move forward. This memo is intended to be one component of an integrated design effort and should be considered in tandem with other deliverables produced at this time to meet the needs of the project.

Figure 1.1 - Proposed Near Term Public Realm Options

The regions included in this phase, which are illustrated in Figure 1.1 include the following:

1.03 Goals and Objectives

Beyond its utility as a piece of infrastructure and a place of employment, today's Sunnyside Yard can be a challenge in the day to day life of Western Queens. A physical barrier that separates Long Island City and Astoria from Sunnyside, the yard is navigated daily by thousands of students, workers and residents on foot or in cars and buses crawling through traffic, unless one is able to travel via the 7 Train.

The Urban Design Team looked at options for how to improve these conditions. The team explored a range of options that would:

- Respond directly to community needs and interests
- Align with the vision and goal of the Master Plan

- Able to be implemented as an independent project without requiring a full-yard Environmental Impact Statement
- Feasible within a near-term time frame (+/- 10 years)
- Change public perception of the Yard

The outcomes of this was a process for ensuring an infrastructure first approach and a recommended set of infrastructural and public realm improvements. (See Appendix A.7.A for further illustrations of the improvement options and components of the plans).

The engineering team reviewed these options and prepared preliminary designs to further determine the viability of these options and the impacts they may have on the rail yard and its operations.

2.00 INTEGRATION OF RAIL NEEDS

2.01 Part of Yard Impacted

Sunnyside Yard is a critical location for rail operations serving the entire Northeast and has been so for more than 100 years. Historically, the existing rail yard has served Pennsylvania Railroad, Penn Central and now Amtrak, New Jersey Transit (NJ Transit) and Long Island Rail Road (LIRR). The Yard is one of the largest rail yards in the world, devoted strictly to handling passenger trains and is the primary yard for trains terminating and originating at Pennsylvania Station in Manhattan (PSNY). The Yard serves trains on Amtrak's Northeast Corridor, Empire Corridor, and Keystone Corridor lines as well as supporting Amtrak's long-distance service. The LIRR's Main Line and Port Washington Branch also encompass the yard.

Sunnyside Yard is the primary location for the storage and maintenance of Amtrak High-Speed Rail (HSR) trains operating between Washington and NYC; this facility is responsible for all starts, turns, and finishes for HSR in the southern part of the Northeast Corridor (NEC). In addition to Amtrak's HSR facility, the potential overbuild site at Sunnyside Yard contains off-peak storage for both NJ TRANSIT and Amtrak, major electrical equipment serving the NEC (e.g., frequency converter), Service and Inspection (S&I) facilities and storage, maintenance facilities, Maintenance of Way (MoW) yard, LIRR storage yard, Amtrak/LIRR Mainline, Loop tracks, and private General Motors (GM) property (See Appendix A.7.B).

For the purposes of the Sunnyside Yard Master Plan rail integration analysis, the yard was divided into rail zones. See Appendix A.7.B. The Public Realm Improvements phase consists of work adjacent to the Thomson Avenue and Queens Boulevard bridges, as well as work along Skillman Avenue, in portions of Zones 1, 2, 3, 7, and 8.

Understanding the criticality of the Yard to the region's rail providers, a major goal of this early phase of design was to "do no harm" to the railroads. The rail impacts and constructability approach documented in this memo considers the construction of the overbuild deck structure within the constraints of the Yard operations, with minimal impact to rail operations for Amtrak and LIRR. Working with the railroad agencies to review the design approach for this phase and to determine the feasibility of proposed changes will result in a feasible, workable, and cost-effective design and construction approach.

2.02 Rail Systems

Construction of the deck in this phase will impact a number of existing rail system installations (refer to Appendix A.7.B – Near term public realm improvement options Rail System Impacts). Based on this early evaluation, many of these impacts have been identified below. The exact location, size, type, and elevation of these impacts will have to be verified in the field. Confirmation of underground impacts will require hand digging and test pits. The typical sketches / drawings shown in Appendix A.7.B are representative based on the conceptual engineering done thus far.

<u>Thomson Avenue Bridge Greenway</u>

Planned improvements adjacent to the Thomson Avenue bridge (Figure 2.1) lie over both LIRR and Amtrak's portion of the yard, Zones 1, 3, 7 and 8 in Figure 2.0.

Anticipated impacts as a result of the Thomson Avenue Bridge Greenway are as follows:

- Next to Thomson Avenue bridge and within the proposed footprint of the new greenway structure to create a widened bridge there are a number of Overhead Contact System (OCS) structures supporting catenary wires, cross track feeders, and along track signal power and traction feeders. These structures will have to be replaced by new parallel structures and catenary wires reprofiled to lower the messenger wire elevations (reduce catenary system height) to maintain a minimum safe electrical vertical clearance. These new OCS structures will also have to be constructed as short as possible considering future expansions of the deck.

Figure 2.1 – Location of Thomson Avenue Bridge Greenway

- Adjacent structures on either side of the bridge will also be impacted due to the reprofiling and relocation of the wires.

- Cross track feeders and their corresponding disconnect switches may be relocated to adjacent poles or installed at the bottom of the new deck on steel pipes using insulated cables. Along track signal power and traction feeders may require additional structures to maintain a minimum vertical clearance. In areas where that is not feasible, these cables may need to be relocated underground.

- A new Central Instrument Location (CIL-1) is located on the new greenway bridge structure footprint. The new deck will have to be designed so the proposed columns or the overhead deck do not impact this control building.

- A number of underground power and communication duct banks, manholes, and pull boxes are present in the proposed bridge structure area. New deck columns will need to be located around these installations. Underground utilities may have to be rerouted around the proposed columns as well. Existing underground drainage and storm sewer installations may have to be relocated.

- Existing Central Instrument House (CIH) F2 is located under the proposed widening footprint near Skillman Avenue and next to the access road running in parallel south of the existing loop tracks. The new deck will have to be designed and constructed so the proposed columns or the overhead deck do not impact this control building nor its existing underground power and communication circuits.

  Refer to Appendix A.7.B – Near Term Public Realm Improvements Phase Rail System Impacts for additional information.

<u>Queens Boulevard Greenway and Extended Area over Mid-Day Storage Yard</u>

Planned improvements adjacent to Queens Boulevard (Figure 2.2) lie over portions of Amtrak's yard as well as LIRR's Mid-Day Storage Yard (MDSY), Zones 1, 2, 3, 7, and 8 in Figure 2.0.

Anticipated impacts to MDSY are as follows:

- The existing cross catenary structures supporting the new lights over the MDSY will have to be removed. Lights and power cables will have to be relocated onto the ceiling of the new deck.

- The existing Car Appearance Maintenance platforms used by LIRR maintenance personnel will have to remain in place and the columns for the proposed deck designed and constructed taking this constraint into account.

- A number of underground power and communication duct banks, manholes, and pull boxes are also present in the proposed bridge structure area. New deck columns will need to be located around these installations. Underground impacts may have to be rerouted around the proposed columns as well.

- Existing underground drainage and storm sewer installations may have to be relocated.

Anticipated impacts to Amtrak structures are as follows:

- An existing access platform/stairs located at the east face of the Queens Boulevard bridge, provides access to the railroad employees into the yard and the Q-Tower Control House. This needs to be accessible during the construction of the new deck or alternate means for access will be required from Queens Boulevard.

Figure 2.2 – Location of Queens Boulevard Greenway and Park Structure

- Next to Queens Boulevard bridge and within the proposed footprint of the proposed bridge structure there are a number of Overhead Contact System (OCS) structures supporting catenary wires, cross track feeders, and along track signal power and traction feeders. These structures will have to be replaced by new parallel structures and catenary wires reprofiled to lower the messenger wire elevations (reduce catenary system height) to maintain a minimum safe electrical vertical clearance. These new OCS structures will also have to be constructed as short as possible taking into account future expansions of the deck. OCS relocations may be particularly challenging over the main lines where track and power outages are difficult to obtain. (See Figure 2.3)

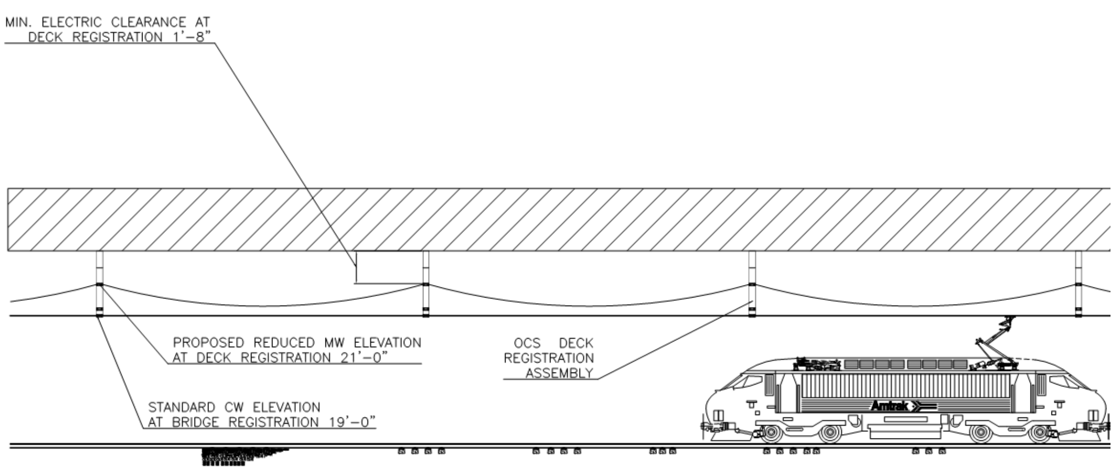


Figure 2.3 – Proposed Reduced OCS Profile and Clearances for OCS Wires Supported Under Deck (Refer to Appendix A.7.B: Public Realm Improvements Rail Systems Impacts for full version)

- Adjacent structures on either side of the bridge will be also impacted due to the reprofiling and relocation of the wires.

- Cross track feeders and their corresponding disconnect switches may be relocated to adjacent poles or installed at the bottom of the new deck on steel pipes using insulated cables. Along track signal power and traction feeders may require additional structures to maintain a minimum vertical clearance. In areas where that is not feasible these cables may need to be relocated underground across the bridge.

- Signal power and communications aerial crossing (QB1-QB2, QB3-QB4), and aerial utility crossing structures will be significantly impacted by the proposed bridge structure. These wires will have to be relocated either aerially to new parallel structures keeping the required minimum clearances, or underground across the tracks. This may be particularly challenging across the existing Westbound Bypass structure. Related underground routes will also have to be relocated and the proposed deck columns constructed around them.

  Refer to Appendix A.7.B – Near Term Public Realm Improvements Rail System Impacts for additional information.

<u>Linear Park Along Skillman Ave.</u>

The proposed linear park along Skillman Avenue (Figure 2.4) runs along Amtrak's Loop Tracks, Zone 8 in Figure 2.0. Anticipated impacts to Amtrak structures are as follows:

- This area contains a number of Overhead Contact System (OCS) structures supporting catenary wires, cross track feeders, and along track signal power and traction feeders. These structures will have to be replaced by new structures constructed away from the proposed limits of the park and catenary wires reprofiled to lower the messenger wire elevations (reduce catenary system height) to maintain a minimum safe electrical vertical clearance. These relocations may be particularly challenging over the main lines where track and power outages are difficult to obtain.

Figure 2.4 – Location of Linear Park Along Skillman Avenue

- Adjacent structures on either side of the bridges (Thomson, Queens and Honeywell) will be also impacted due to the reprofiling and relocation of the wires.

- Cross track feeders and their corresponding disconnect switches may be relocated to adjacent poles or installed at the bottom of the new deck on steel pipes using insulated cables. Along track signal power and traction feeders may request additional structures to maintain a minimum vertical clearance. In areas where that is not feasible these cables may need to be relocated underground across the bridge.

- A number of underground power and utility duct banks, manholes, and pull boxes are also present within the footprint of the proposed park which may have to be relocated or incorporated into the new deck.

- The existing aerial insulated communication cables will have to be relocated away from the park area into the proposed retaining wall.

- Underground and aerial LIRR power and communication crossing currently running across the proposed footprint of the linear park will have to be relocated underground. This may be challenging due to the different grade elevation and the numerous existing underground installations in the area. The existing underground and aerial 26.4kV power cables running near the entry will also require relocation.

- Access road and access ramps from Skillman Avenue which provide railroad employees vehicular access to the south of the yard and the East River Tunnels need to be accessible during the construction of the new deck or alternate means for access will be required from Skillman Avenue.

  Refer to Appendix A.7.B – Near Term Public Realm Improvements Rail System Impacts for additional information.

2.03 Rail Requirements

<u>Horizontal Track Clearances</u>

Requirements and Standards

Minimum horizontal track clearances within Amtrak's Sunnyside Yard, as it pertains to column locations, are defined at two levels:

- 16'-0" from centerline of track for any permanent obstruction (Amtrak standards)
- 8'-6" from centerline of track (as per New York State law)

Any violation of the 16'-0" requirement can be approved by Amtrak while any variance of the 8'-6" requirement must be approved by the New York State Department of Transportation.

Minimum horizontal track clearance requirements for column locations within the MDSY are as follows:

- 12'-4 ¼" from centerline of track. Standard side clearance on all permanent obstructions (as per LIRR Standard Drawing 820-10 Minimum Railway Clearances)
- 9-4" from centerline of track. Minimum clearance required for all tracks from which vehicle inspections and light maintenance will occur (as per LIRR Maintenance of Equipment department requirements)
- 8'-6" from centerline of track. Minimum legal side clearance (as per New York State law)

Additionally, for both Amtrak and LIRR, these clearances must be increased through track curvature to account for excesses the vehicle generates as it navigates curved track. This is due to the nature of rigid straight vehicles being located on a curve resulting in what is called center and end vehicle overhang. To accurately model the excesses generated by track curvature, and to account for the transition between tangent and curved clearances, the vehicle clearance envelopes were pushed, through CAD software package Bentley Rail-Track, along all alignments and through switches generating a footprint called the Vehicle Swept Path. This modeling creates a footprint showing an 8'-6"' clearance from centerline of track that accounts for not only tangent and curve clearance requirements, but also the transitions. Columns can be located outside this swept path footprint to meet the minimum clearance requirements. Clearance diagrams can be found in Appendix A.7.C.

Since each agency has its own criteria for how these excesses are to be calculated, different vehicle outlines are required to accurately model the clearance footprints for each railroad. Amtrak requires an additional 1.5" of clearance for every degree of curvature while LIRR requires an additional 1" of clearance per degree of curvature. By changing the length of the vehicle modeled, and the spacing of the vehicle trucks, the curvature clearance excess required by each agency can be appropriately modeled. This is illustrated in the Figures 2.5 and 2.6 below. Clearance diagrams can be found in Appendix A.7.G.

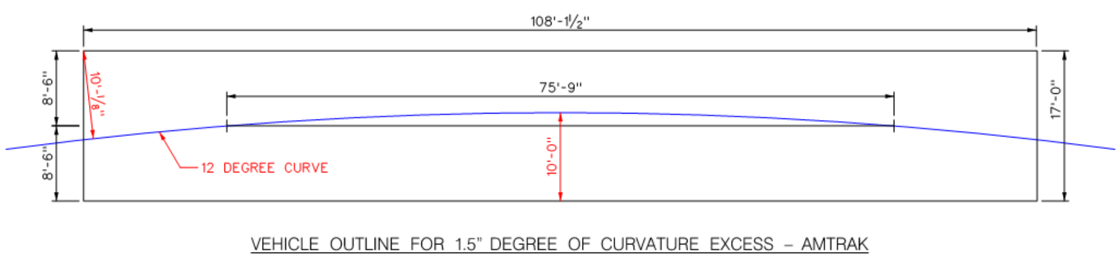


Figure 2.5 – Amtrak Vehicle Outline for Excess from Track Curvature

In the figure above, a 108'-1/2" long vehicle with trucks (wheels) spaced at 79'-9" and drawn at 17'-0" wide represent the 8'-6"' clearance to either side. In the example above the vehicle is placed on a 12-degree curve. Because Amtrak criteria requires an additional 1.5" of clearance per degree of curvature it means an additional 18" of clearance is required, which translates to needing an actual physical clearance of 10' to achieve an effective minimum clearance of 8'-6".

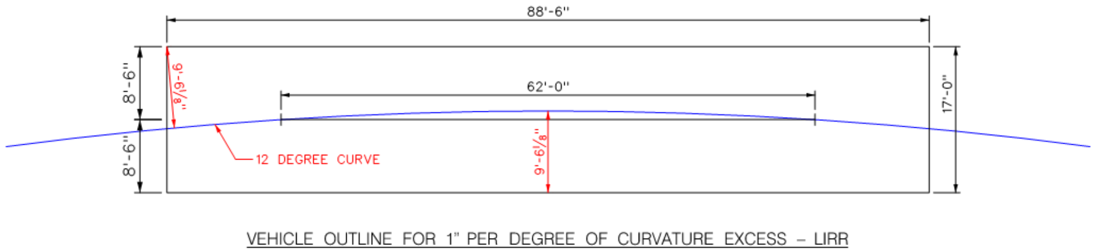


Figure 2.6 – LIRR Vehicle Outline for Excess from Track Curvature

In the figure above, an 88'-6" long vehicle with trucks (wheels) spaced at 62'-0" and drawn at 17'-0" wide represent the 8'-6"' clearance to either side. In the example above the vehicle is placed on a 12-degree curve. Because LIRR criteria requires an additional 1" of clearance per degree of curvature it means an additional 12" of clearance is required, which translates to needing an actual physical clearance of 9'-6" to achieve an effective minimum clearance of 8'-6".

Through curves, where one rail is raised above the other to overcome the centrifugal forces a train experiences while traversing a curve, known as superelevation, additional clearances must be applied. This is calculated by further increasing the clearances described above, for the inside of the curve only, by adding an additional 1" of clearance for every 5' above the top of the inside low rail for every inch the outside rail is raised above the inside low rail. Typically, yard tracks are not superelevated and it is anticipated that that the majority of the MDSY and SSY track will not require additional clearances due to superelevation. Figure 2.7 below illustrates how superelevation excess is calculated and applied.

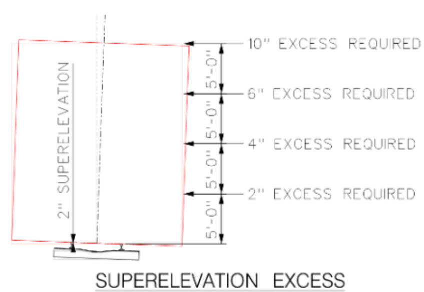


Figure 2.7 –Superelevation Excess from Track Curvature

See Appendix A.7.G Structural Drawing Set for Column Clearance Zones which indicates locations where the 16'-0" (Amtrak) and 12'-4 ¼" (LIRR) clearances are not maintained.

Vertical Track Clearances - Requirements and Standards

Vertical clearances for all track not electrified by OCS must meet a minimum clearance, as prescribed by NYSDOT, of 22'-00" from top of rail to the underside of structural deck or other permanent obstruction.

For OCS electrified track vertical clearances from top of rail to underside of structural deck or fixtures are as follows:

- Amtrak ET200 – Minimum Roadway Clearances, minimum 26'-9" from top of rail to any overhead bridge and other structures in electrified territory for 24'-6" trolley wire height.

These values are only valid for OCS systems where along- and cross-track feeders are not present. Many structures in Sunnyside Yard support these feeders which can increase the minimum to 40'-0" to account for the minimum electric clearances for 12 kV and 34 kV systems and design requirements.

<u>Vertical Structures - Existing Conditions</u>

- Amtrak OCS
    - Existing OCS structures within the area covered by this phase are different in that the elevation of the OCS and ancillary wires at each structure varies due to the variable spans and the multiple overhead obstructions such as bridges, transmission poles for signal power lines, cross-track feeders, along-track feeders, cable drops, etc. These existing structures and wires extend up to 70'-0" above top of rail (Refer to Appendix A.7.D - Existing OCS structures).
- Lighting Structures
    - Several lighting structures were installed as part of MDSY construction within the area covered by this phase. Each lighting pole has a maximum height of 36-feet and is encased in a 3-foot diameter pole foundation.
- Utility bridges
    - Within the Public Realm Improvements footprint there are some utility bridges. Power lines and communication and signal power circuits are run aerially across the tracks inside conduits mounted on these utility truss structures spanning multiple tracks and extending up to 50' above top of the rail.

<u>Vertical Structures - Proposed Conditions</u>

- Amtrak OCS
    - Two Reduced Overhead Catenary System (OCS) clearances have been proposed to Amtrak, one with and one without along- and cross-track feeder heights, see Figure 2.8 and Figure 2.9 below.

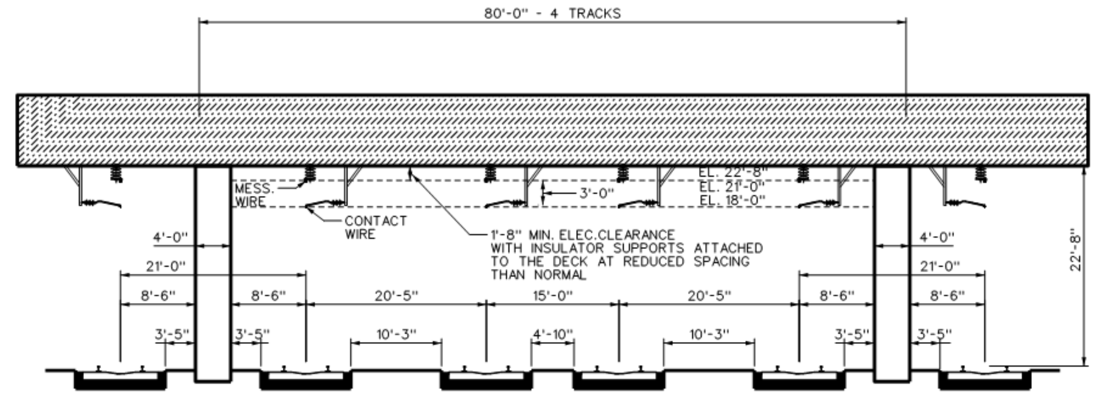


Figure 2.8 – Reduced Amtrak OCS Clearances without along and cross track feeders (Refer to Appendix A.7.E – Proposed Amtrak OCS Clearances for more detail).

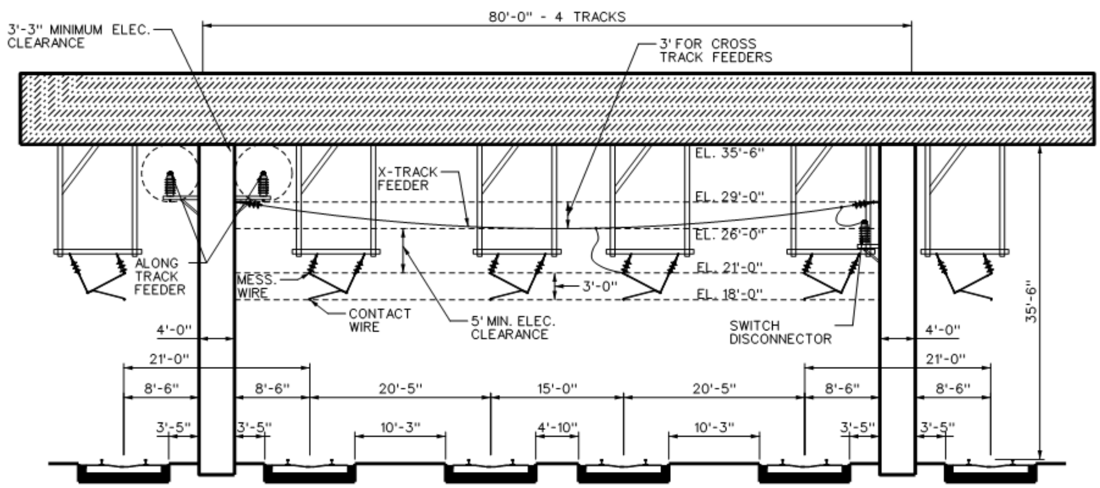


Figure 2.9 – Reduced Amtrak OCS Clearances with along and cross track feeders.(Refer to Appendix A.7.E for more detail).

- These reduced minimum clearances will allow a minimum contact wire height of 18’-0” and a maximum messenger wire height of 21’-0”. This will require temporary intermediate supports and extensive design and construction staging efforts. OCS wires will need to be reprofiled to within the minimum system height to allow for installation of temporary support structures above. This will allow for transfer of the catenaries and removal of the existing cross catenary structures.

- Constructing the deck at the current proposed height would require reprofiling and transferring the OCS system. This will need to be accomplished in accordance with the requirements of maintaining operations on the railroad. A detailed construction sequence for reprofiling of the OCS system will have to be developed as the design progresses.

- The proposed OCS construction sequence (refer to Appendix A.7.E- Proposed Amtrak OCS Clearances and Staging) requires:

a. Underground relocation of aerial traction power, 60 Hz power feeders and signal power circuits.

b. Installation of new construction breaks (sectionalizing switches, section insulators, split tension air breaks and/or full tension air breaks). The existing system is not fully sectionalized, and the construction of a lower deck will require isolating a group of tracks within the construction limits.

c. Installation of temporary intermediate OCS structures to reprofile and reduce the system height of the existing OCS wires.

d. Installation of sections of walls and decks between the existing catenary structures. These existing structures will remain inside the gaps in the deck.

e. Transfer and reprofile OCS wires on the new deck. Insulated cross track feeders will be installed in steel conduits mounted on the ceiling. Disconnect switches and operating mechanisms will be mounted on the adjacent walls.

- Lighting Structures
  - Any deck structure must either clear MDSY lighting structures or these elements must be modified as part of the deck construction. As the proposed deck elevations are set based on typical vertical track clearance, the SSY-MP design proposes lowering and mounting the lighting structures on the underside of the deck construction.
  - Several lighting structures were installed as part of MDSY construction within the area covered by this phase. Each lighting pole has a maximum height of 36-feet and is encased in a 3-foot diameter pole foundation.
- Utility Bridges
  - Utility power lines, communication, and signal circuits mounted on utility bridges across the tracks will need to be relocated underground in new duct banks or micro tunnels excavated under the tracks.

2.04 Equipment & Facility Ventilation

With an active rail yard below the deck, ventilation and Fire & Life Safety (F&LS) requirements were explored for the public realm improvements. Although this phase significantly reduces the amount of the Yard to be decked over in the short-term, understanding these requirements is a crucial component to ensuring the safety for the daily occupants of the below-deck space.

Queens Boulevard and Thomson Avenue Greenways

As the decked area for the greenways is approximately 30 ft along both Queens Boulevard and Thomson Avenue, the total width of the road bridge is not expected to exceed 300 ft. Based on application of NFPA 130 with some principles gathered from NFPA 502 clause 7.2

Application, the minimum fire protection and fire life safety requirements, based on tunnel length, are categorized as follows:

- Tunnel lengths less than 300 ft (defined as Category X in NFPA 502 as referenced by NFPA 130), mechanical ventilation is not required.

Sunnyside Station

The more expansive area intended for overbuild as part of the public realm improvements has been analyzed through fire hazard modeling for this design phase. Modeling results indicate that a non-mechanical (or natural) ventilation scheme will provide adequate mitigation of fire and high pollutant concentration hazards for this phase (See Appendix A.7.K and Section 6.06). Ventilation plants or distribution plenums, while required within other portions of the overbuild as the deck development expands in future phases, are not required at this time.

Although the initial analysis using a Computational Fluid Dynamic (CFD) model showed that no openings in the deck is required (See Appendix A.7.K), as the open-air condition outside of the decked zones results in adequate natural ventilation, further fire hazard analysis will be necessary as the design of this phase progresses. The proposed lightweight “bath tub” shaped beams may trap smoke, thereby negatively influencing non-mechanical ventilation. Careful review of the height of the bottom of the beam in relation to the floor is required to confirm that natural ventilation is sufficient.

Structural Durability

For structural fire safety, the proposed beams must retain their bearing capacity under the thermal stress of a fire. Structural fire proofing must be installed for all structural elements under this phase. As design progresses future analysis will be further conducted to identify the potential thickness or configuration of fire proofing that will be required to protect the structure. Current national standards require four (4) hour fire protection (NFPA 502) for comparable structures and it is recommended that spray on or ridged fire protection board be applied to achieve this fire rating at this conceptual design stage. This is discussed in more detail in Section 6.03 in the Structural Fire Durability sub-section.

Fire Protection

The deck adjacent to Queens Boulevard and Thomson Avenues would be a limited access highway that should have standpipe installation as per NFPA 502 which references NFPA 14. Standpipes installed on bridge decks will serve the yard below. Standpipe installation design will be further reviewed as the design progresses to comply with NFPA 14 – 2017 and NFPA 130 – 2017. This is discussed in more detail in Section 6.03 in the Standpipe System sub-section. See Appendix A.7.K for Overall Fire Protection System with Standpipe Network Within Yard Area.

Detailed thermodynamic and dispersion analysis has shown that non-mechanical (natural ventilation) process will provide sufficient management of train heat and other air quality impacts from diesel locomotives and maintenance operations.

3.00 CONSTRUCTION METHODOLOGY

The various components of the potential public realm improvements have different strategies associated with their construction methodology. The majority of this section addresses the Greenways and Prototype Park. These regions will provide evidence that decking is achievable over the rail yard with minimal disruption to the operations below. The final portion of this section addresses the Skillman linear park, which requires standard cut-and-cover construction methods typical with highway construction.

3.01 Restrictions on Use and Loading Assumptions for Overbuild Deck

Given the difference in size and scope of the parks and greenways from future phases of the Master Plan the engineering team used loading assumptions that differed from those addressed in the Conceptual Deck Design Report. As stated previously, one of the goals of this portion of the Master Plan was to design it in such a way that it could be built as quickly and efficiently as possible, without adversely impacting rail operations. This lends to a deck solution that does not include structures above as a general condition, and to a solution that can be developed and constructed quickly. In order to align with this scenario, a lighter load scenario was developed, and is indicated on drawing S-021 in Appendix A.7.G.

The lighter load scenario, referred to as the "Light Park" loading, is sufficient for vehicular traffic, proposed as part of the Master Plan, with a standard code-based live load of 300 psf and a superimposed dead load that will be sufficient for roadway buildup, as well as some allowance for utilities running through the deck. In areas outside of the roadway, the vehicle allowance is reallocated to landscaping loads in combination with a standard code-based live load of 100 psf for public assembly.

<u>Main Line Loading Assumptions</u>

A further reduced loading scenario is applicable at the portions of the deck over the Main Line due to the long span, the depth restrictions, and the need to erect with as little disruption to the train service below as possible. This further reduced loading scenario is indicated as "Decking Over Main Line" on drawing S-021 in Appendix A.7.G. In part, this area has further reduced loading because the span between column lines at both Queens Boulevard and Thomson Avenue is 150 feet. There is one other region adjacent to Queens Boulevard which is also a 150 foot span, however the majority of the deck spans range between 80 and 130 feet. See figures 3.1 and 3.2 for an illustration of these maximum deck spans.

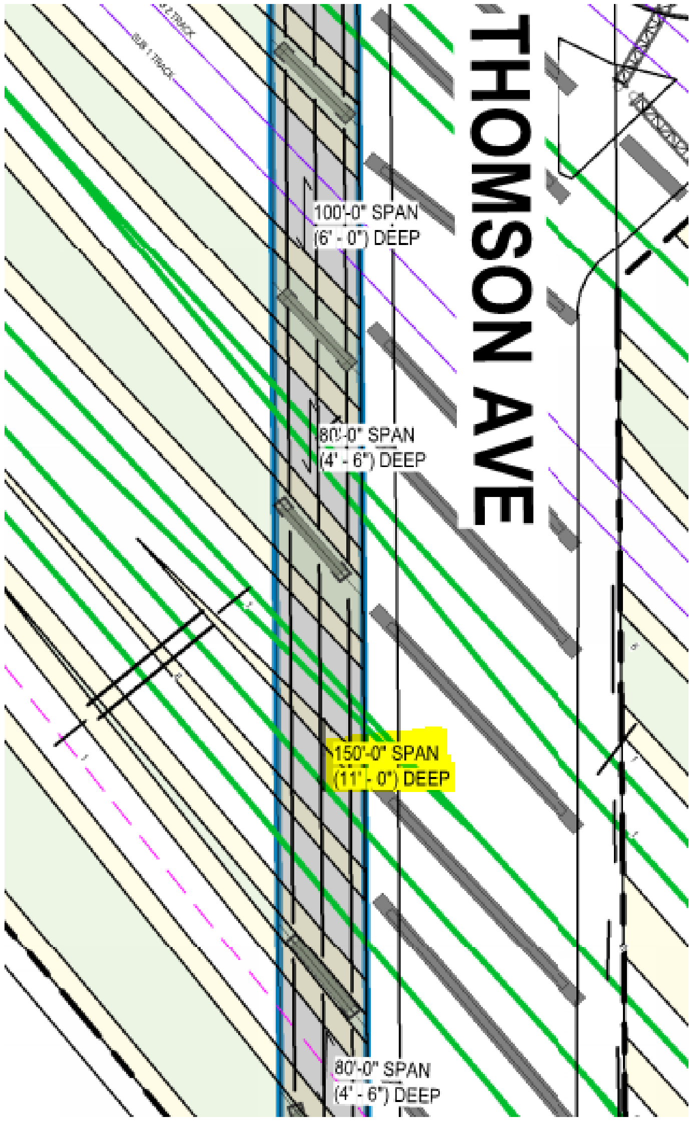


Figure 3.1 - Maximum Spans of 150' over Main Line at Thomson Avenue

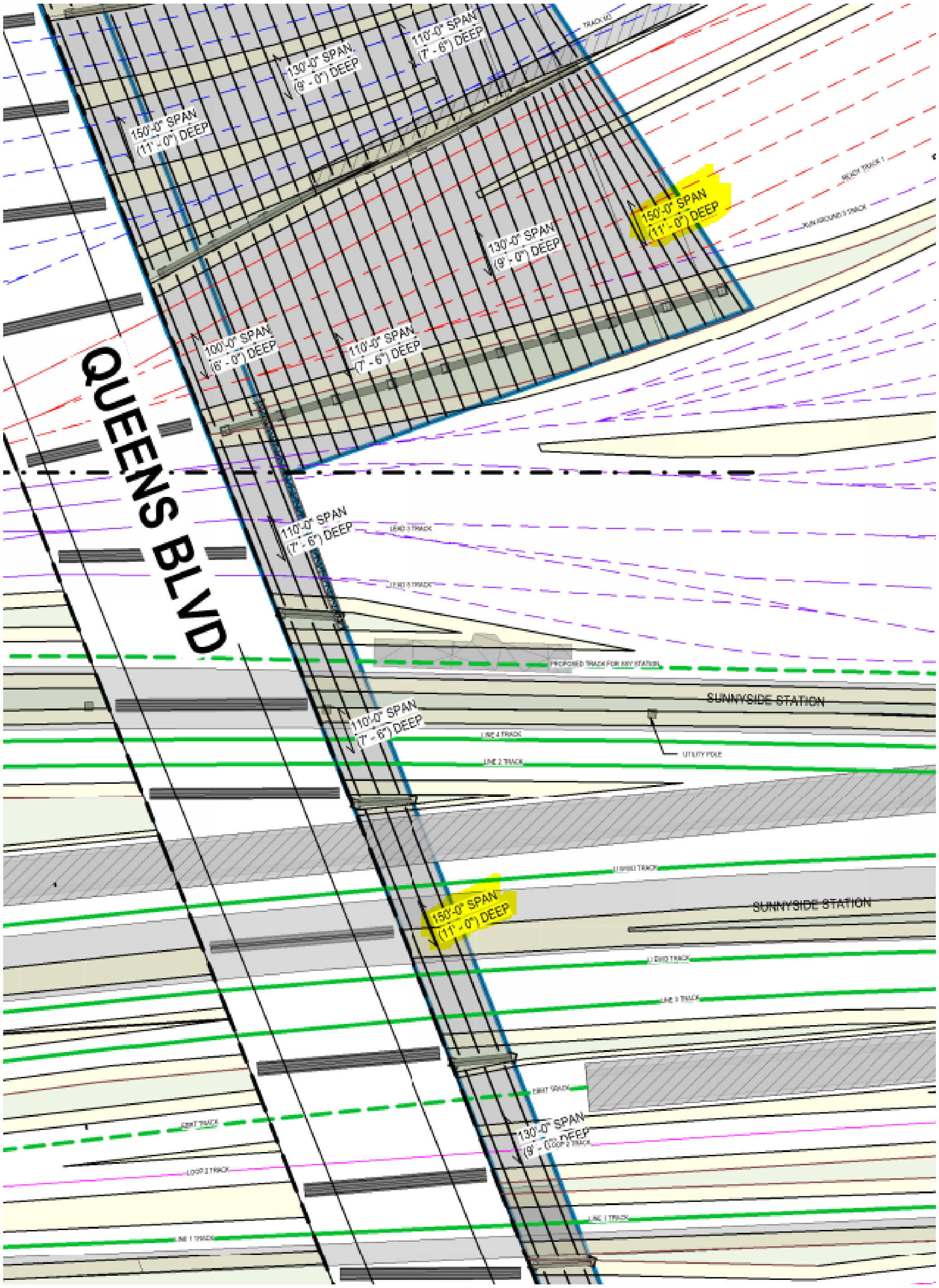


Figure 3.2 - Maximum Spans of 150' over Main Line and SE Edge of Prototype Park

Another contributor to the need for reduced loading is the available envelope for the deck construction. As addressed in the Conceptual Deck Design Report, there are vertical clearance requirements for the track operation below. In the region adjacent to the bridges, the design methodology is for the bottom of deck to be no lower than the bottom of structure at the existing Queens Boulevard bridge, so while the new deck overbuild will not provide optimal clearance, it is no worse than the current condition. See figure 3.3 below.

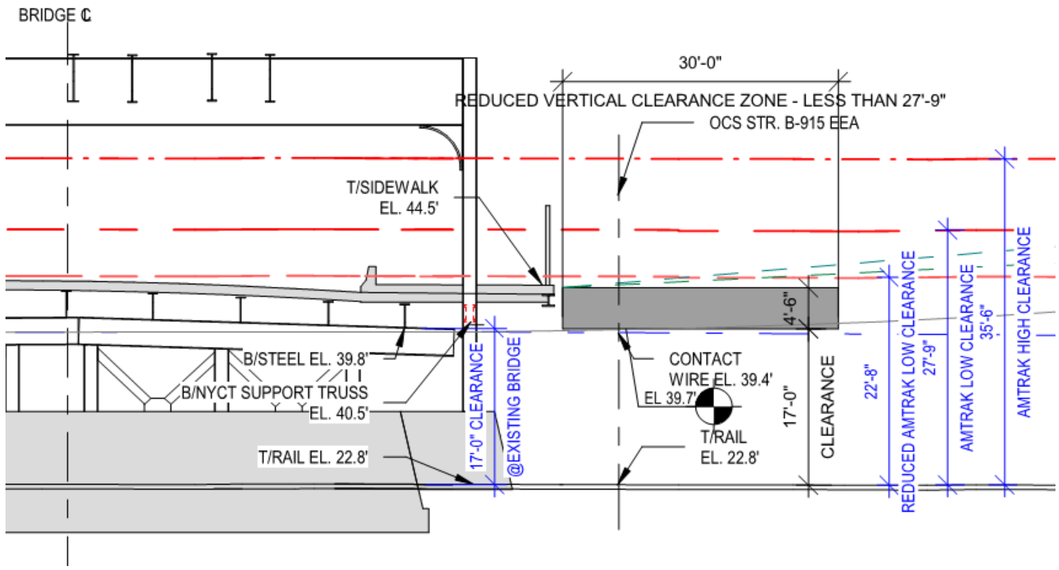


Figure 3.3 - Typical Greenway Section Adjacent to Queens Boulevard Bridge Maintaining Same Vertical Clearance as Existing Structure

The intent is for the top of structure to be consistent with adjacent spans, and not significantly higher than the adjacent top of grade at the Queens Boulevard structure. For the region over the Main Line, a total deck depth of 11'-0" is not workable in this particular region without making the top of deck significantly higher than the top of existing structure. See figure 3.4.

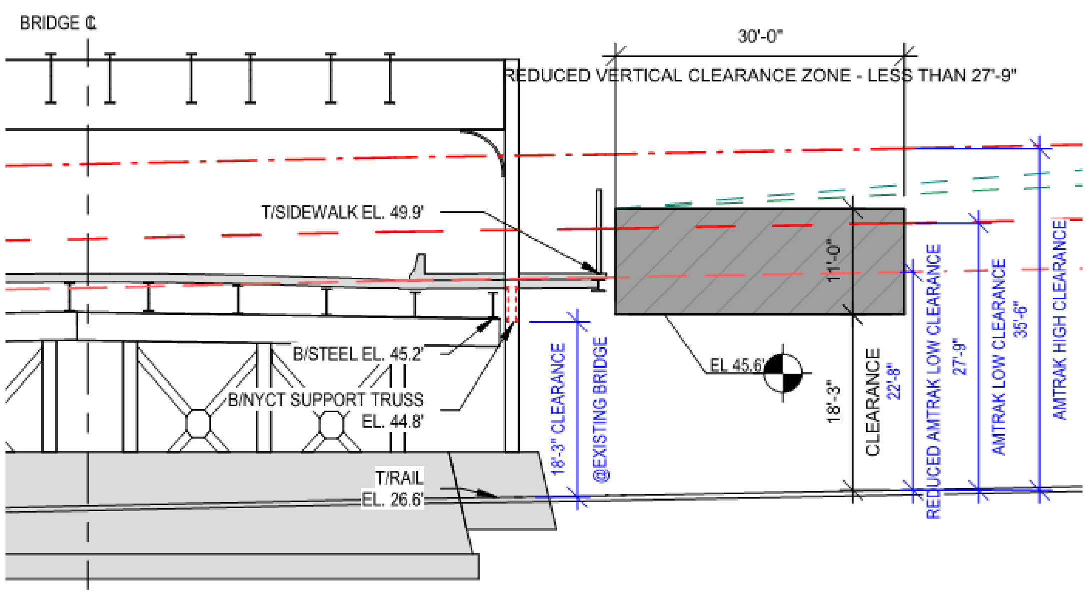


Figure 3.4 - Greenway Section Over Main Line Adjacent to Queens Boulevard With Excessively High Top Of Deck Relative To Existing Bridge Structure

A lighter load allows the structure depth to be reduced to 7'-6", which is more compatible with the existing adjacent bridge envelope. A final driving factor for the lighter load scenario over the Main Line is the need to erect quickly to minimize disruption to the train service. The criticality of this train service is addressed in the Comprehensive Master Plan memo in the section regarding existing railyard operations. Lighter, more manageable deck pieces can be installed more quickly with a gantry crane erection scenario and could even potentially be launched directly off of Queens Boulevard. See the section on deck construction for additional detail.

For this "Decking Over Main Line" loading scenario, the live load is reduced to 100 psf, which is the standard code-based live load for public assembly. In addition, allowances are made for super dead load to accommodate some reduced landscaping loads, and some reduced utility loads. In these regions, it is logical to assume that the utilities servicing the programming above deck can be routed in from the Northern Boulevard side of the site and will not need to cross over the Main Line. Additionally, because the Main Line footprint is generally not decked over as part of the Comprehensive Master Plan except in these few select areas, it is reasonable to assume that Amtrak will not require significant allowances for utility loads in this location related to ventilation, power, or railroad operations.

Sunnyside Station Loading Assumptions

Sunnyside Station is the only above-deck structure, and so it can be specifically designed to include a truss system that transfers the excess building weight to the column lines. The "Light Park" loading scenario addressed earlier will still apply within the envelope of the building, and will be sufficient to carry interior loading of the ground floor, as well as some reserve capacity to potentially support some mezzanine structures, provided the loads can be sufficiently distributed. See Figure 3.5 below for an illustration of the structural system.

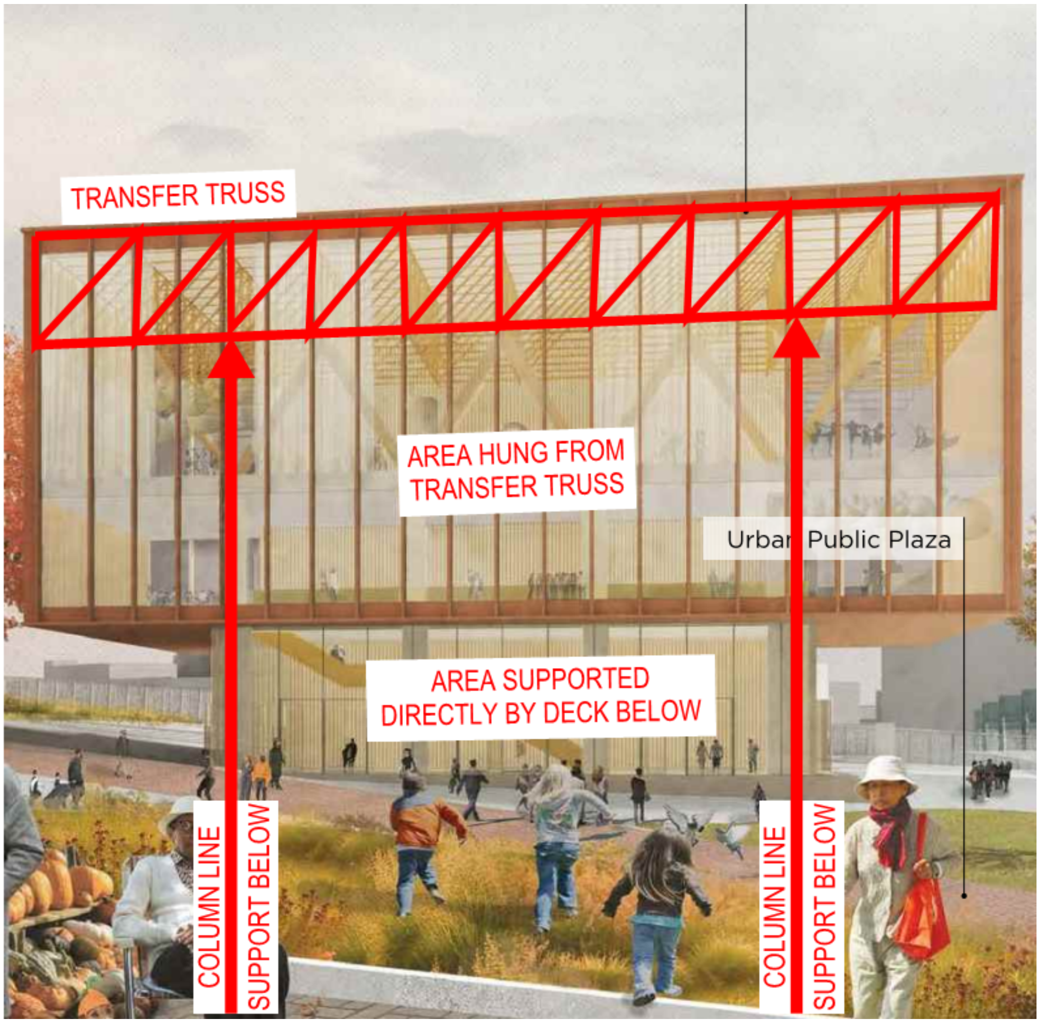


Figure 3.5 - Structural Support Scheme For Sunnyside Station

3.02 Deck Systems and Construction

In an effort to provide a structural deck scheme that is unique to the public realm improvement options loading scenario, a precast concrete "tub girder" design was developed. These tub girders are illustrated in section 1 of sheet S-520 of Appendix A.7.G, and in figure 3.6 below. The tub girders are held to a standard width of 5'-0" wide nominally and vary in depth depending on the span between column lines. The "U" shape of the cross-section allows for utilities and landscaping to occupy the space between the upstanding legs of the structural element. As illustrated, the girders are spaced at 10'-0" on center, leaving a gap between upstanding legs of 5'-0" nominal. Precast planks will span across these gaps and will extend to cover the hollow of the tub, except in strategic locations where access will be provided for utility maintenance or landscaping requirements. As illustrated in section 2 of sheet S-520, the tub could be utilized as a tree pit where loading allows. Provisions should also be included to provide a crawl space to allow inspections of the girder structure as required by code. Spaces between the upstanding legs can be reserved for Railyard systems below the deck such as ventilation, overhead catenary power systems, or other utilities.

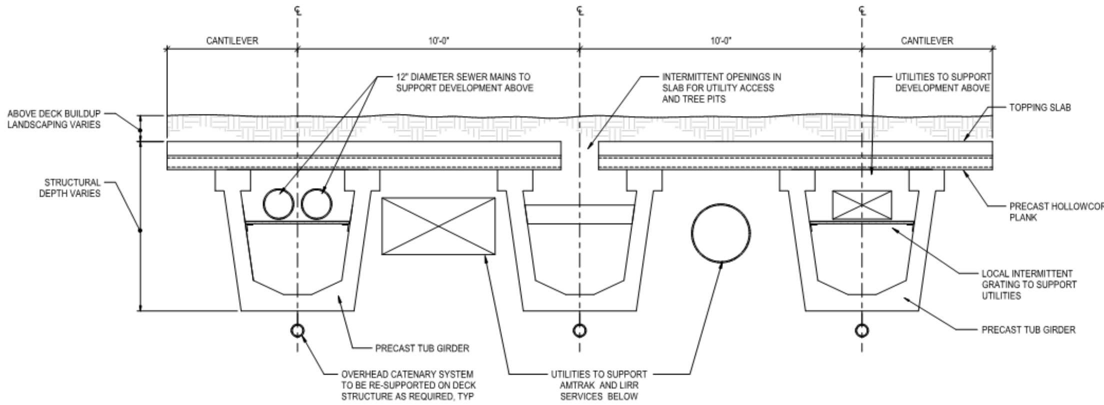


Figure 3.6 - Tub Girders at Greenway Section

The choice of concrete as a material is driven largely by serviceability considerations. Where steel can be fireproofed with spray-on fireproofing or intumescent paint, neither of those options are particularly durable under long-term exposure to diesel train fumes. The requirement for long-term maintenance would be substantially higher for a steel deck option than for a concrete solution which would wear better in an exposed environment.

The choice of precast concrete versus cast-in-place concrete is driven by the need for quicker installation times. The Conceptual Deck Design Report addresses the costs associated with track outages, and the impact on the railyard operations. Forming the concrete girders in shop, and then launching them into place, will take more coordination on the part of the contractor and the city to route them to the site and set up a staging area. But the impact on the critical operations of the rail yard will be significantly lower, which is identified as a goal of the project not only to reduce overall cost, but also to maintain a positive working relationship between the railyard entities and the city agencies involved.

A gantry crane system is required to launch the preast girder lengths across the yard. It will be challenging to identify appropriate locations to place these cranes. If agreement could be reached with the property owners of the lots adjacent to Northern Boulevard could be reached, then they would be potential locations. Alternatively a portion of the area adjacent to Skillman Avenue on the south end of the site could be reserved for launching the tub girders, especially if that region will be developed as the Skillman Linear Park whereby it would only be a matter of coordinating phasing within the project. However much less area is available, and so the tub girders would need to arrive on site in significantly smaller units, making the construction scheme more similar to segmental concrete box girders. A final launching scheme could be imagined from the Queens Boulevard existing structure; however the load capacity of the existing structure may be prohibitive, even in the case where traffic is restricted entirely.

The geometry of the deck for this phase of the project is closely coordinated with the existing bridge structures, as well as the geometry required to integrate the next phases of the project. See Figure 3.7 below for a sample expansion joint detail which could be utilized for a seamless transition between deck structures. The expansion joint allows independent movement, which is ideal for keeping the existing DOT bridges separate from the deck overbuild. Figure 3.8 illustrates that the scheme for the top of deck geometry across the phase boundary is sufficiently close to allow for a continuous top of grade achievable with proper landscaping. The goal is that when the future overbuild is complete, the average observer would not know that there were ever separate decking structures.

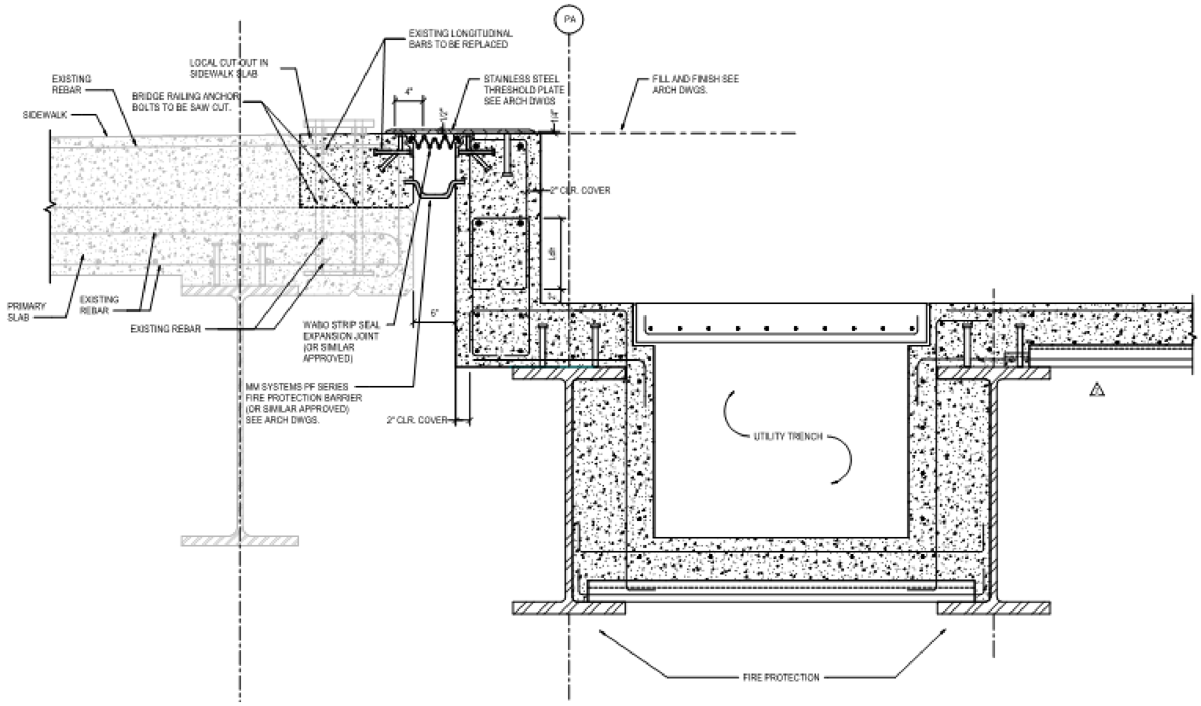


Figure 3.7 - Sample Expansion Joint Detail

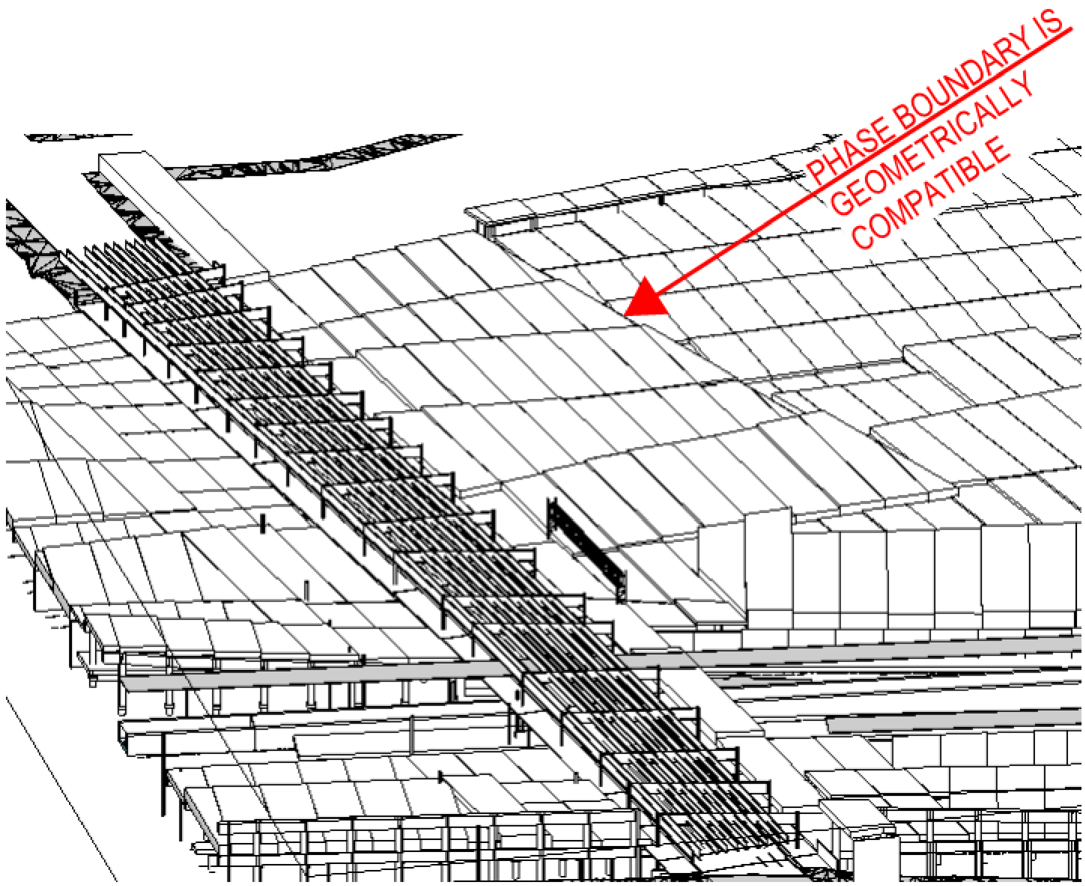


Figure 3.8 - Geometry of Phases to be Compatible

3.03 Column and Superstructure Systems and Construction

For this public realm improvement options superstructure, a design is presented that incorporates cast-in-place reinforced concrete columns. Factors that drive this selection are consistent with the durability argument in the deck section of this memo. For an illustration of this concrete superstructure system, see Figure 3.9. The rectangular shapes of the column can be narrowed in the cross-track direction as required to meet minimum horizontal clearances, particularly in the Mid-Day Storage yard. Modular formwork systems are available which would allow for quick erection and minimal disturbance to the tracks on either side of the column lines.

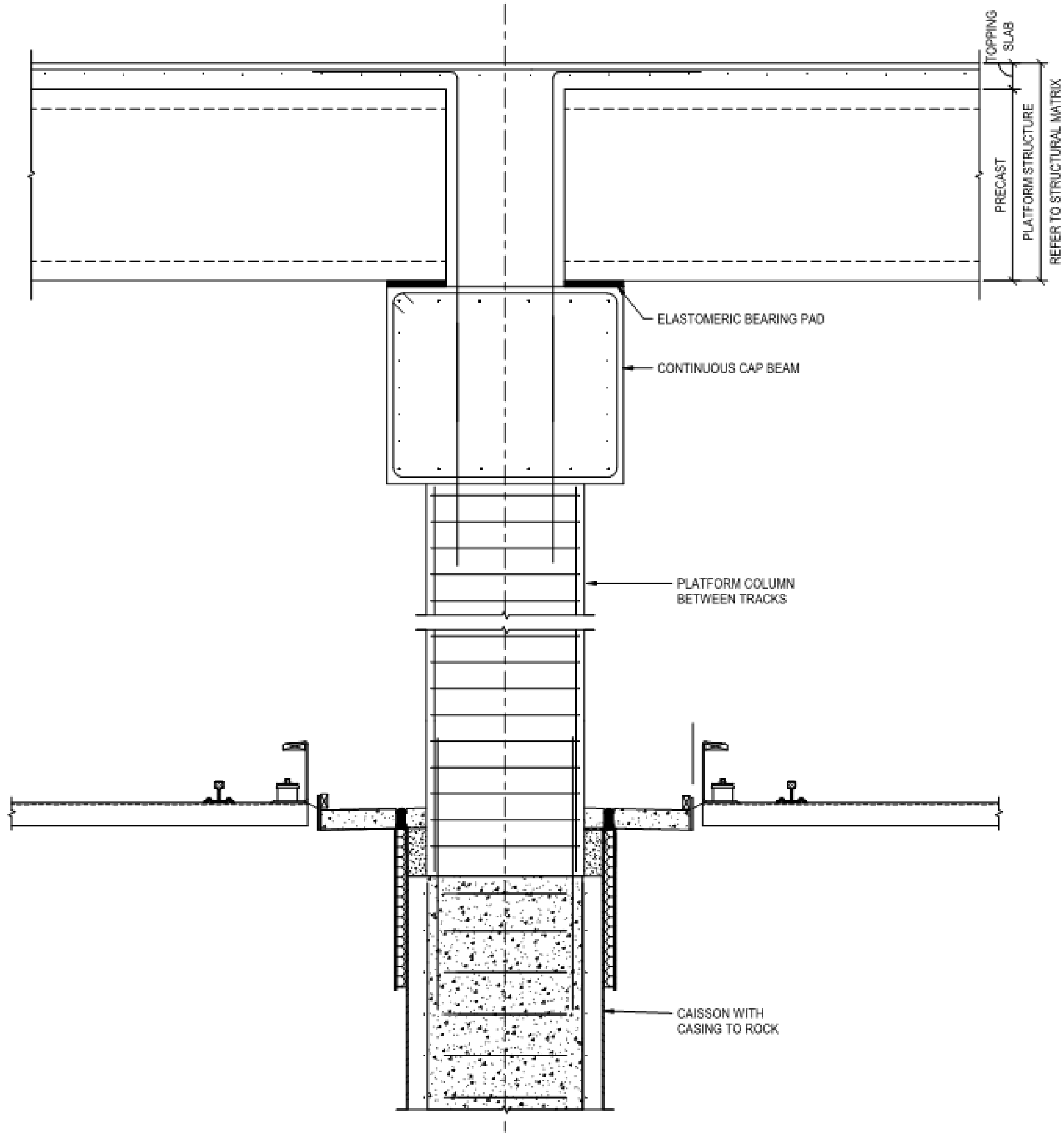


Figure 3.9 - Section at Concrete Superstructure

Special consideration for the superstructure scheme may be required in the region of the modified yard access point adjacent to Queens Boulevard. See the section on "Integration of Rail Needs" for a more detailed discussion of replacing the existing yard access point, which is a series of stairs adjacent to the Queens Boulevard bridge, with a new access point, which will be an elevator / stairway core at the south end of the Prototype Park. See Figure 3.10. When completed, the intent is to have the access point integrated into Sunnyside Station. Additional columns with a cap beam, or a crash wall, can be introduced as indicated in Figure 3.10, to provide deck support north of the core. In this region there will still be sufficient horizontal track clearances to the North to meet the Amtrak-specified minimum. This framing scheme will be sufficient for a temporary phase where the deck is constructed but not Sunnyside Station, in the event that the project is completed in a phased manor. And at the point of Sunnyside Station construction, the column line to the South of the elevator / stairway core can be extended up to support the upper floors of Sunnyside Station.

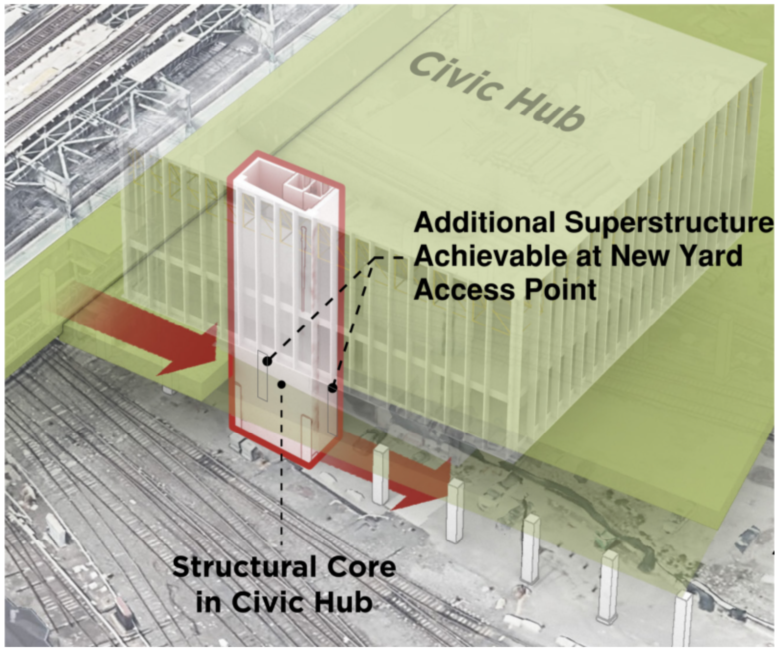


Figure 3.10 - Section at Concrete Superstructure

The lateral load resisting system is also a consideration for superstructure, and how it interacts with expansion joint locations. The Sunnyside Station area is significantly wider in the along-track direction as opposed to the 30-foot wide Greenway areas. As such, the Sunnyside Station structure can rely on moment frame action between the columns and girders to sufficiently resist wind and earthquake loading. Because the Greenway areas are not so wide, they will require concrete bridge piers acting as shear walls. These two different systems, and their differential stiffness, makes the line between the park and the Greenway a natural choice for an expansion joint. In addition, because the Greenway areas will require bridge piers acting as shear walls, the size of the pier element will be impractical for a precast option and is best poured in place. This is consistent with the approach to provide cast-in-place reinforced concrete columns.

3.04 Foundation Systems and Construction

Consistent with the recommendations for the Conceptual Deck Design Reprot, the drilled caisson foundation scheme is illustrated for the public realm improvement options. Foundation plan level drawings in Appendix A.7.G indicate the locations of the caissons and approximate diameters of the drilled shafts. See Figure 3.11 for an excerpt from Appendix A.7.G. For the Greenway portions of the deck, two caissons total are expected to suffice, one at each end.

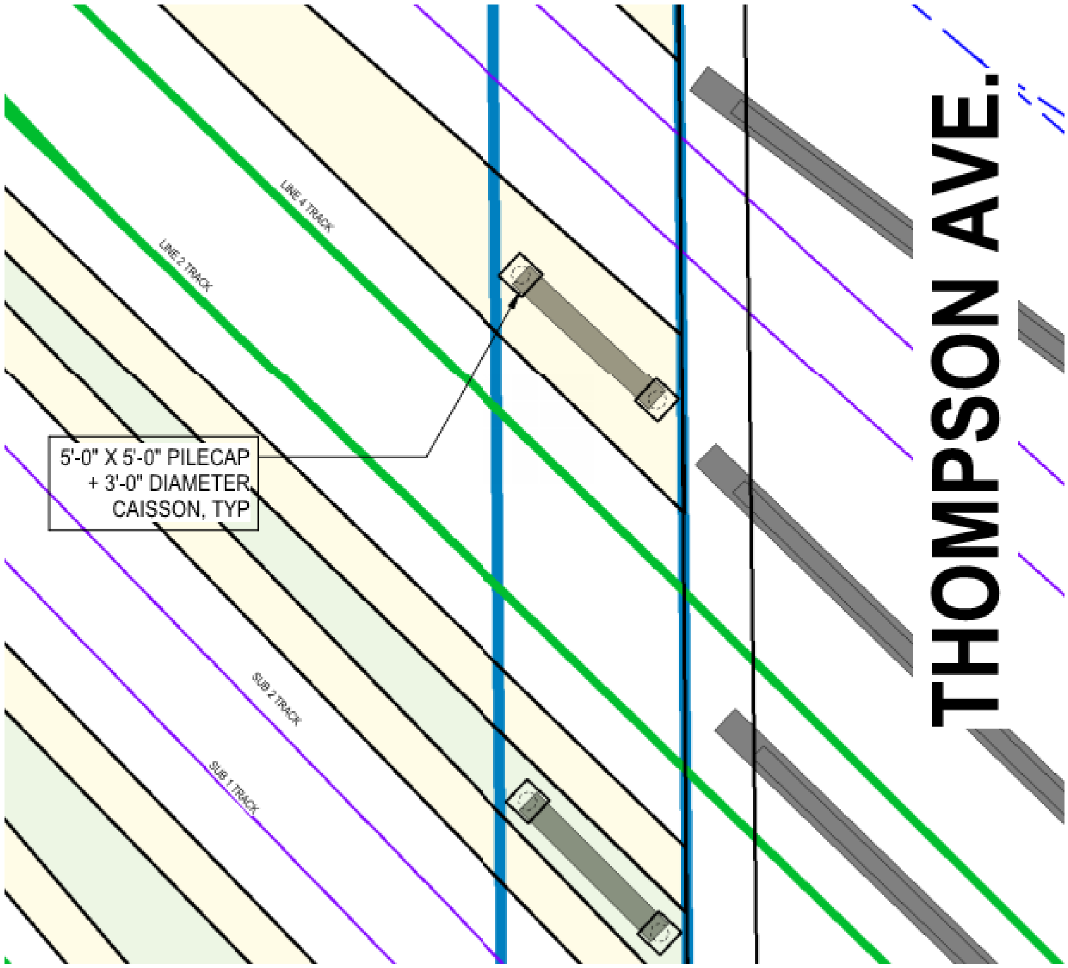


Figure 3.11 - Selected Foundation System for this Phase at Thomson Ave Greenway

Other foundation systems presented in the Conceptual Deck Design Report include Barettes for much higher capacity, or shallow foundations for much lower capacity. Given that the public realm improvement options are not loaded with mid-rise or high-rise buildings, the barette scheme is not necessary. Shallow foundations could potentially be appropriate in future phases, particularly in the Eastern region of the site where there is ample area to stage and construct spread footings. However, given the density of the tracks in the regions selected for the public realm improvement options, shallow foundations do not seem feasible.

It is expected that the drilling and pouring equipment required to install the caissons can operate within the widths between the tracks without significantly disturbing the tracks themselves. However, it is also anticipated that the tracks adjacent to any ongoing work would need to be decommissioned temporarily for safety and clearance reasons.

3.05 Skillman Linear Park Construction

The future site of the Skillman Linear Park is situated on an existing embankment. At the top is the area adjacent to Skillman Avenue to the South, and to the North is the railyard. Clearances from existing tracks are not a concern in terms of construction requirements. Note that there are impacts on the rail yard infrastructure, which are addressed in Section 2.

Figure 3.12 illustrates a section along the park where the standard highway cut-and-cover construction methodology may be employed. See also Appendix A.7.G, Sheet S-499. This scenario allows for cellar construction which may be used as programming space either for the park, or for the railyard agencies. Excavation down to sufficiently stiff load-bearing soils could disturb the adjacent access road at the North side, and so deep caisson foundation elements are illustrated to minimize the impact. Wider spread footings that are more cost effective may be achievable on the South side of the structure. The deck that spans between foundation walls could be cast-in-place or precast concrete, at the contractor's option, with no significant cost differential.

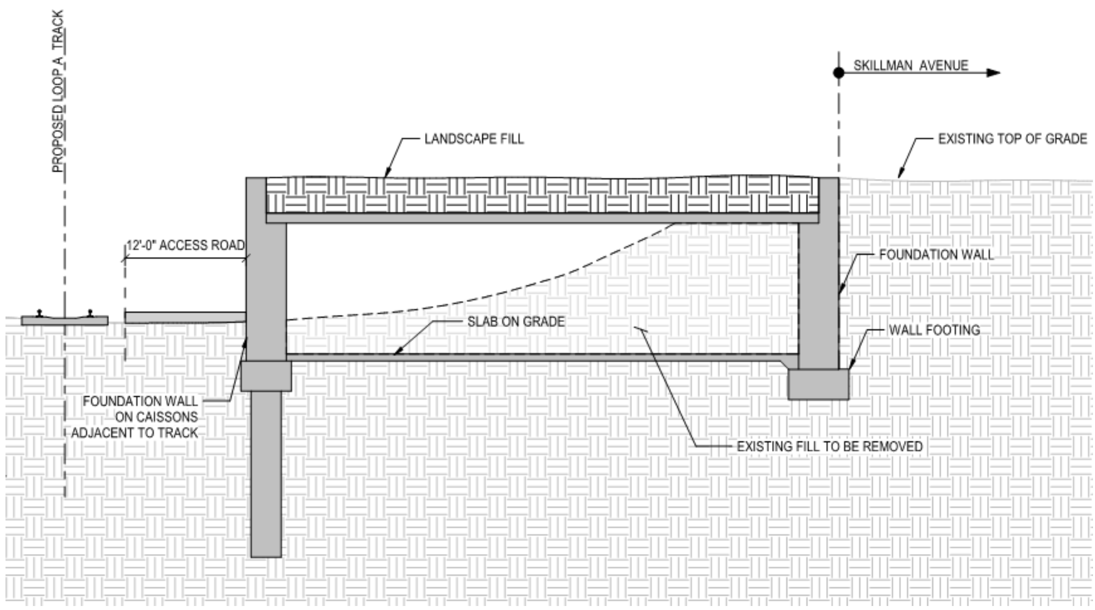


Figure 3.12 - Section at Skillman Linear Park with Cut-And-Cover Construction

The other alternative method for construction is a simple retaining wall structure as illustrated in Figure 3.13. To avoid a large footing that may impact the adjacent tracks, the wall could be mechanically stabilized with soil anchors into engineered fill.

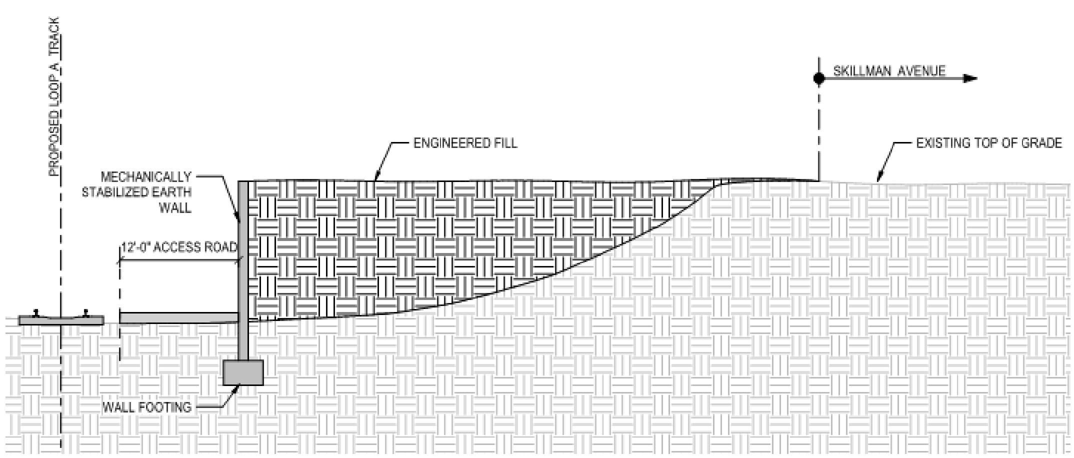


Figure 3.13 - Simple Retaining Wall Structure for Skillman Linear Park

Where the typical construction sections outlined above are disrupted with access ramps from the surrounding neighborhood to the yard, additional retaining walls and concrete beam elements may be provided on either side of the ramps to support the elevated deck structure. See figures 3.14 and 3.15 for illustrations.

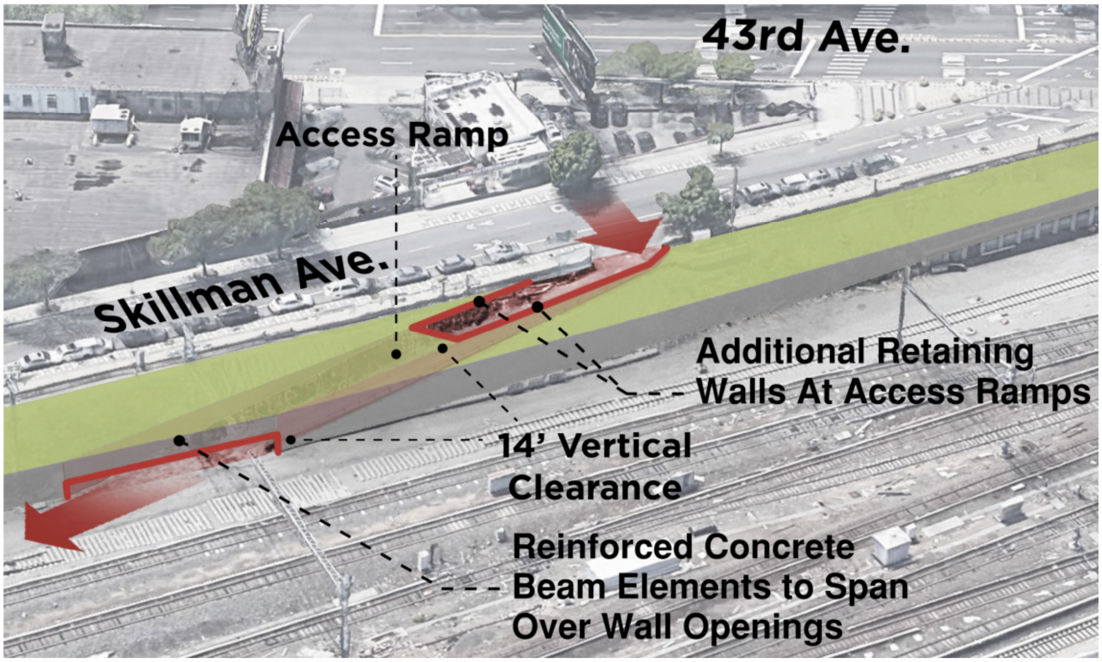


Figure 3.14 - Additional Retaining Walls At Access Ramps

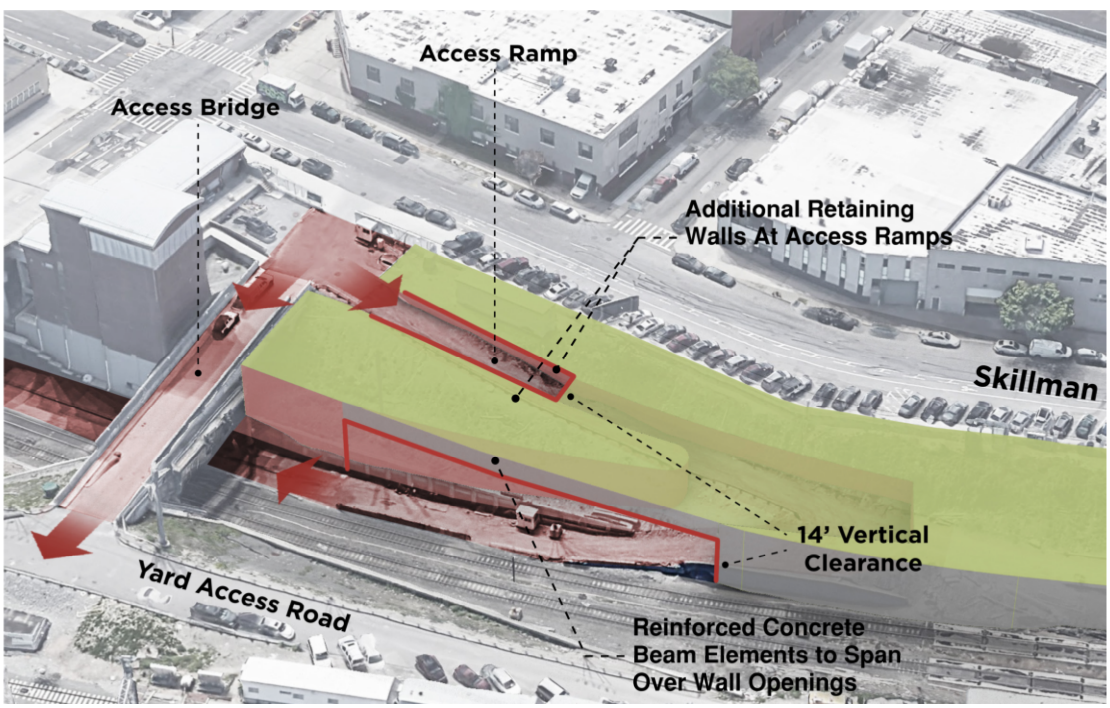


Figure 3.15 - Additional Retaining Walls at Access Ramps

4.00 INFRASTRUCTURE PLAN

This chapter addresses the stormwater and utility routing associated with the various regions of this phase. Flow volume calculation and delivery of stormwater to the existing sewer infrastructure is addressed within the context of different methodology assumptions. Utility routing is addressed in terms of the project location and the existing connection to the city grid.

4.01 Stormwater Management

As described in previous sections, the conceptual Parks and Greenways options design consists of two decked greenways enhancing the Thompson Avenue and Queens Boulevard bridges, a decked open space to the east of Queens Boulevard hosting a large community facility, and a strip of open space with “park-activating” buildings constructed on grade along the northern edge of Skillman Avenue, between Thompson Avenue and 39th Street Bridge.

Preliminary estimates of stormwater runoff and peak discharge were calculated using the United States Department of Agriculture’s (UDSA) Urban Hydrology for Small Watersheds TR-55 Graphical Peak Discharge method. Because of the natural geographic breaks of the bridges, three distinct drainage areas were considered for the Parks and Greenways Phase. The Thompson Avenue greenway and the open space development on Skillman between Thompson Avenue and Queens Boulevard comprises drainage area 01. The decked area to the east of Queens Boulevard, the conceptual community facility, the Queens Boulevard greenway, and the open space development on Skillman between Queens Boulevard and Honeywell Avenue comprises drainage area 02. Drainage area 03 consists of the strip of open space and building development on Skillman Avenue between Honeywell Avenue and 39th Street, as shown in Figure 4.1.

Figure 4.1 - Parks and Greenways Drainage Areas

Park, street, roof and plaza areas in each drainage area were measured for calculation of a weighted curve number, a variable that impacts expected runoff. Type III Rainfall Distribution precipitation data for the 2-, 5-, 10-, 50- and 100-year, 24-hour rainfalls was used to calculate the stormwater runoff and stormwater peak discharge. Table 4.1 presents these values.

Table 4. 1 - TR-55 Peak Discharge (without detention)

Tributary Drainage Area	Area (acres)	$q_{p,\ 2\text{-year storm}}$ (cfs)	$q_{p,\ 5\text{-year storm}}$ (cfs)	$q_{p,\ 10\text{-year storm}}$ (cfs)	$q_{p,\ 50\text{-year storm}}$ (cfs)	$q_{p,\ 100\text{-year storm}}$ (cfs)
DA_0_1	1.4	1.3	2.2	3.3	5.1	6.4
DA_0_2	5.8	9.4	14.6	20.0	28.7	34.5
DA_0_3	2.8	5.1	7.7	10.5	14.7	17.6

The TR-55 Graphical Peak Discharge method is considered an appropriate runoff analysis methodology for watersheds over 10 acres. However, the New York City Department of Environmental Protection (DEP) has jurisdiction over all municipal sewer and water infrastructure in the City. DEP methodology for designing storm detention facilities and connections to sewers is based in the Rational method, considered appropriate for watersheds under 10 acres. Given the location of Sunnyside Yard within an area of DEP jurisdiction, a parallel tabulation of runoff using DEP criteria is presented in Table 4.2. The design storm for this calculation is roughly equivalent to the 10-year storm using theTR-55 method.

Table 4.2 - Rational Method Peak Discharge (without detention)

Tributary Drainage Area	Q_{Peak} (cfs)
DA_0_1	2.0
DA_0_2	17.3
DA_0_3	9.6

It is important to consider the Climate Resiliency Design Guidelines, published by the Mayor's Office of Recovery and Resiliency. Their 2018 projections estimate that more intense rainstorms will occur with greater frequency, and that what we currently consider to be a 50-year design storm will have a probability of 5-year recurrence by 2080. When future phases of the deck are being designed and constructed, it is likely that they will need to consider more robust drainage infrastructure than is required under current guidelines.

Current DEP standards are considered when estimating detention requirements. While it is expected that both rainfall intensity and DEP regulations of how much storm flow is allowed into sewers will change over time, this is a reasonable estimate based on current conditions. The majority of the sewers within and surrounding the Yard are combined sewers, conveying both sanitary and storm flows. Based on available records, sewers surrounding the Yard largely have adequate capacity in dry weather, and are at or over capacity during storm events. While it is likely that the greater Long Island City area will require capital sewer infrastructure upgrades in the coming decades, it is also expected that some level of detention or retention of stormwater will be required for new development on the Sunnyside Yard deck to reduce impact on surrounding sewer infrastructure in wet weather conditions.

To develop an order of magnitude estimate of potential detention volumes, the 10 year DEP design storm calculation of the runoff rate for each drainage area was used, as presented in Table 4.2. It is assumed that the deck and open space constructed on grade, which will be developed as a system of buildings, plazas, and parks, will be detained at a rate that meets current DEP guidelines for the borough of Queens. These calculations to not account for potential reduction in detention volumes that could be facilitated if direct discharge to a waterbody was achieved.

Preliminary detention volumes calculated using these assumptions comprise 2.5%-7.5% of the footprint for each phase, at 1-ft storage depth. Volumes for each drainage area are presented in Table 4.3. This volume could be located in the interstitial space between the top of structural deck and finished grade, within water features at the deck or park surface, or within chambers constructed as part of the structural deck.

Table 4.3 - Preliminary Storage Volume Calculations

Tributary Drainage Area	Volume (cf)	Percent of Drainage Area (at 1-ft Storage Depth, %)
DA_0_1	1,510	2.5
DA_0_2	16,220	6.5
DA_0_3	9,170	7.5

4.02 Utility Routing

There are limited opportunities for connectivity from the decked portions of the Parks and Greenways options to the surrounding street grid. The community building on deck will likely need a full suite of services. New electric, telecom, gas, and water service will be routed from the street grid to the north or south, within the tube girders that are used to construct the deck. If the deck is privately owned, operated, and maintained, agency and franchise infrastructure may end at the limit of the deck, with developer-owned extensions of the utility network servicing the building on the deck itself. Sanitary flow from the community facility will either drain via gravity to the north, if feasible, or be conveyed by a pump and force main system. Figures illustrating connection opportunities for the Parks and Greenways construction are included in Appendix A.7.H.

Electrical, gas, telecom and water infrastructure are present throughout the length of Skillman that fronts on the development. Sanitary flow from the park-activating buildings within the Skillman Avenue open space development will drain to existing combined sewers in Skillman Avenue and 35th Street, where feasible. An estimated 500-ft of new combined sewer will be required to facilitate connections to areas that do not front an existing sewer. Storm drains from drainage areas 02 and 03 will likely connect to the surrounding combined sewers through detention facilities. If feasible, drainage area 01 of the Parks and Greenways options could connect to the Amtrak storm outfall within the Yard, limiting the amount of detention that may be required. Refer to Figure 4.1 for an illustration of drainage areas. Potential locations for riser connections from the Parks and Greenways Phase development to the existing storm sewers within the Yard are identified in figures provided as Appendix A.7.H.

5.00 MAINTENANCE AND OPERATIONS

5.01 Operations and Maintenance Requirements

Operations below the deck for this phase include the Main Line, Loop Tracks, MTA LIRR Midday Storage Yard, and Amtrak Bowl Tracks. The deck elements within this area include the foundation, columns, piers and the bottom of the deck or superstructure. For the foundation or drilled shafts, no maintenance is required once installed as it is below grade and protected from below deck operations. For the columns, piers and bottom of the deck and superstructure, these elements are exposed to potential train or vehicular impacts.

Crash wall protection is recommended for columns and piers that are in close proximity to moving trains. Over time structural deterioration may occur for these elements especially if they are exposed to constant moisture due to deteriorating deck joints and waterproofing or flooding below deck. It is recommended that a condition assessment be performed on the substructure and superstructure every two years to maintain integrity and proper function.

Operations above deck include areas adjacent to the NYCDOT Bridges, streets, sidewalks, buildings, open space, parks and greenway. The deck elements within this area include the deck surface and the deck joints. The deck surface will be exposed to vehicular and pedestrian traffic and moisture from rain events. Proper surface treatment with overlays for streets and sidewalks, waterproofing and proper drainage are recommended for maintenance. Expansion joints will be subject to movement over time and some joint may be exposed to moisture from rain events depending on their location. Similar to the elements below the deck it is recommended that a condition assessment be performed on the deck surface, drainage appurtenances and deck joints every two years to maintain integrity and proper function.

NYCDOT is responsible for maintaining their bridges across the yard. As work progresses on any of these options further work will be needed to develop a maintenance plan for these portions of the project and cooperation between city agencies will be crucial.

5.02 Security and Blast Resistant Design

A blast-specific protective design risk assessment of the Sunnyside Yards public realm improvement options was performed by the design team. The approach and methodology for this assessment was presented to EDC, NYPD Counterterrorism Division and FDNY for comments and coordination. Going forward, a risk based approach should be used to layout and design the overbuild structure. The intent is to reduce risk by providing access control around Sunnyside Station, shortening the spans wherever possible and incorporating ductile detailing.

6.00 FIRE AND LIFE SAFETY ANALYSIS

The Fire and Life Safety (F&LS) approach and the resulting Fire Protection Concept for the Public Realm Improvement optionsare based on the current generally accepted rules of technology. While this phase is much smaller in scope than the comprehensive master plan, ongoing coordination with MTA/LIRR, Amtrak, FDNY, and NYPD will be necessary to develop and finalize the F&LS concept. Existing guidelines are used for orientation and as a starting point for F&LS design. It will be imperative that as the project continues into the next phase of design, a working group (client, MTA/LIRR, Amtrak, FDNY, NYPD, consultant team) is formed to define the safety approach, develop safety standards and work together to develop, review and reach consensus on the final design and construction approach.

6.01 Overview

Consideration of the Risks

The specific dangers for the Sunnyside Yard rail operations can be classified as indicated in Table 6.1. The effects of hot events are generally very serious and can endanger human life on a large scale but can also lead to the collapse of underground structures.

Table 6.1 – Specific dangers for the Sunnyside Yard rail operation

Cold Incidents	• Derailment • Collision of two trains • Collision of a train with a person (e.g. during maintenance work) • Collision of a train with an object in the track area • Danger to persons from traction power
Hot Incidents	• Fires • Explosion

Protection Goals

The qualitative protection goals considered for the underdeck area are listed in Table 6.2. These protective goals only apply to the covered below ground area.

Table 6.2 – Qualitative Protection Goals

No.	Protection Goal (Qualitative)	Explanation	Protection Goal (Quantitative)
1	Protection of persons / staff	Tenable conditions shall be maintained during the evacuation phase.	The height of 2.5 m to be clear of smoke during evacuation path (see NFPA 502[1]). The evacuation time on track level should not exceed 15 min.
2	Protection of fire / rescue teams	FDNY and rescue services shall be protected against heat and smoke to ensure the rescue and firefighting operation.	The height of 2.0 m (see NPFA 502[2]) to be clear of smoke during rescue phase during the evacuation path. Injured persons, or staff not able to evacuate shall be safe when lying on the floor or seating.
3	Mitigation of fire effects (e.g. spread of fire, collapse)	Collapse of the structure shall be avoided under all circumstances. Fire spread to adjacent trains should be avoided	Steel temperatures shall not exceed 500 °C / 932 °F which is understood as critical temperature for load bearing steel structures. The temperature of the smoke layer 2.5 m above ground shall not exceed 450 °C / 842 °F to not ignite neighbor trains by the smoke layer[3]. The train wall of the neighbor train shall not exceed 500 °C / 932 °F to avoid ignition.

[1,2] NFPA 502 – 2020, Standard for Road Tunnels, Bridges, and Other Limited Access Highways

[3] Austrian Professional Fire Brigades Standard, RTVB 125 S, Smoke and Heat Exhaust Systems, 2010

6.02 Egress Strategies

As far as occupancy is concerned, it should be noted that this is not a public area. The persons staying in the project perimeter are characterized as follows:

- are healthy and able to evacuate or start first intervention (e.g. with extinguisher)
- are aware about the risks in the specific SSY environment (electricity, moving trains, fire risks, etc.)
- have communication measures,
- have personal safety equipment,
- are trained and know the environment (equipment, stairs, doors, etc.),
- can provide first aid, help others and can use hand fire extinguishers at their own discretion.

The egress strategy should comply with Amtrak, NFPA 130, New York City Building Code (NYCBC), and Building Code of New York State.

The design of egress elements will be based on the following criteria:

- Means of Egress is continuous to a public way (2014 ed. NYCBC Section 1007.2)
- Overbuild of Amtrak Right-Of-Way Design Policy, Revision six (6), September 11, 2015
- Occupancy classification of buildings as defined by Chapter 3 of 2014 ed. NYCBC
- Fire-resistance rating of enclosed exits (2014 ed. NYCBC Section 1019.1)

Overbuild construction will require the addition of code compliant egress facilities from existing track level structures within the overbuild to a public way space on top of the overbuild. Access and egress provisions must address normal use, maintenance and emergency services access, and evacuation of Sunnyside Yard or trains. NFPA requires that the distance between exits to the surface should not exceed 2500 feet. However, this distance is much longer than the length of the deck during this project phase.

A risk analysis / engineering approach should be conducted during the next project phase to determine an acceptable distance between emergency exits which might vary according to the foreseen use of the underground area. Additionally, space required for firefighters' equipment in the stairway areas should be coordinated with emergency services.

At present, existing exit stairs at Queens Boulevard will be kept and used for both: (1) egress and (2) access.

6.03 Fire and Life Safety Requirements

Overview

As discussed in Section 2.03, although the Public Realm Improvement options would result in a much smaller amount of deck coverage in the short-term, determining the need for fire protection and ventilation systems are crucial to ensuring the safety of below-deck occupants. A summary of Fire and Life Safety (FLS) requirements are compiled in this section, a more detailed discussion can be found in Appendix A.7.L.

Ventilation and Fire Protection Systems

Fire within a train car could create a smoke condition that endangers life and health below the deck and could release heat that impacts the deck structure. The introduction of the overbuild structure, even during this phase, creates a more enclosed space at the yard level. This necessitates design solutions that address ventilation and fire safety, while also complying with Amtrak's Design Policy for Overbuild of Amtrak's Right-of-Way (See Appendix A.7.I). As MTA/LIRR does not have a specific manual, and since SSY is a unique site, project-specific requirements for both Amtrak and LIRR will be further developed and discussed during design development.

Ventilation

As discussed in Section 2.03, based on the total coverage area of the Public Realm Improvement options, if each side of the structure is open to the outside without any blockages, natural ventilation is shown to be adequate based on preliminary modeling. Therefore, it is not required to build out a ventilation system and plant.

Fire Protection Systems

The Public Realm Improvement options configuration does not deck over any occupied structures at the yard level (Commissary, S&I facility etc.) that would require installation of fire protection systems within the buildings.

However, the following conditions at the deck/bridge level do require more detailed analysis to determine system design:

- Air-right structure (Sunnyside Station) shall be designed for building code occupancy. Fire protection design for the air-right construction of Sunnyside Station will need to include structural fire protection for the structure supporting the occupancy.
- The bridge deck for both Queens Boulevard and Thomson Ave. would be a limited access highway that should have standpipe installation. The standpipes installation should be further reviewed to comply with NFPA 14 and NFPA 130 (actual versions)
- Detailed design of standpipe system installation on each of these bridges will need to account for air venting.
- Fire protection systems will be influenced by the requirements of NFPA 130, FDNY, and the building codes of New York State and New York City. Neither the Amtrak Policy for Overbuild nor NFPA 130 specifically address covered railyards, but they do address tunnels, which are likely applicable. These documents, in coordination with the railroads and agencies, will guide future analyses of the storage track areas elsewhere in the yard using computer modeling of fire scenarios.

Fire Detection System

Detection and alarm systems (e.g. CCTV cameras, heat detectors, visibility detectors) are required below and within the deck area. Once a fire breaks out in the yard area under the deck, the fire detection system is expected to be able to detect the fire. The fire command center (LIRR/Amtrak) will immediately confirm the fire incident, take actions to initiate evacuation, and inform the FDNY, which will initiate the fire rescue efforts once the transit agency (LIRR/Amtrak) deems it is safe for FDNY to rescue and fight fire. The design is subject to further confirmation with Amtrak/MTA. See incident Response Flow Chart in Figure 6.1.

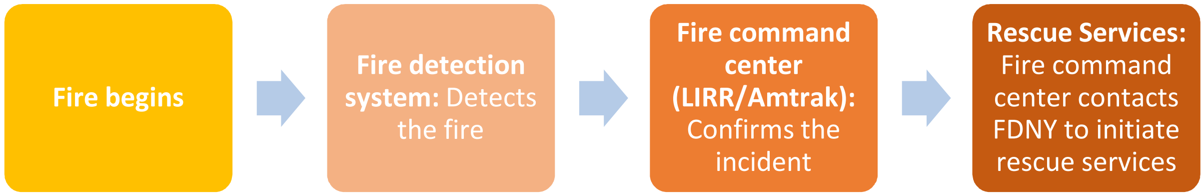


Figure 6.1– Incident Response Flow Chart

Firefighting Measures / Water Supply

FDNY response equipment access into the rail yard needs to be accounted for in the yard planning. Figure 6.2 provides a schematic diagram of the proposed fire protection system used within the yard area. Based on the existing fire hydrant locations, Appendix A.7.J provides an overall plan view of the yard area with potential fire department connection locations and standpipe network to reach each fire hose valves located in the egress stairs locations.

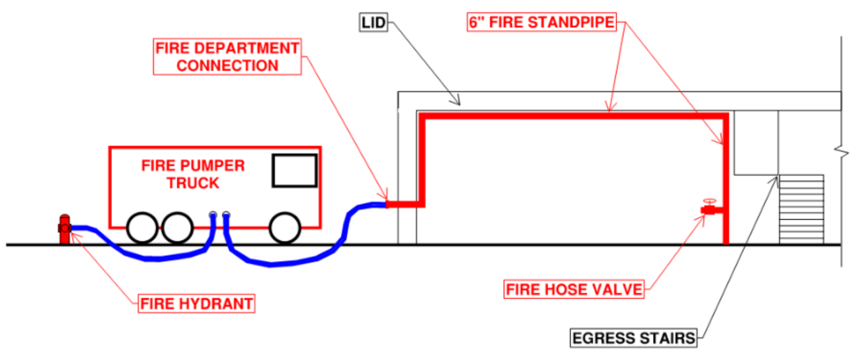


Figure 6.2- Proposed Fire Protection System Schematic Diagram

Standpipe System

A standpipe system will be considered for firefighting in the railyard, and fire department connections (FDC) for the New York Fire Department provided on the surface. This will be provided where physical factors prevent or impede access to the water supply. The design of the standpipe system will be based on the availability of fire hydrants, and their proximity to the yard as well as available emergency access locations.

Fire Sprinkler System

During the master plan coordination with FDNY, NYPD, MTA and Amtrak, the use of dry sprinklers was discussed. Based on that coordination, consideration can be given for a dry type sprinkler system with sprinklers mounted on the underside of the deck (spray heads positioned within 6” of the deck). The merits of including a dry sprinkler must be critically evaluated in the course of further project planning. For more information please refer to Appendix A.7.L.

6.04 Structural Fire Durability Assessment

A generic structural fire durability assessment has been conducted for typical steel beams considering the design fire and different ceiling heights. It can be concluded, that – even under conservative assumptions – the fire loads on beams in the ceiling area (e.g. for structural support) do not lead to unacceptable beam temperatures and hence, risks. For more information please refer to Appendix A.7.L.

6.05 Emergency Vehicle Access

Emergency vehicle access locations on top of the deck are adjacent to the bridges where the emergency exits are situated, as well as via the existing bridges and along Skillman. Additionally, those exits points are collecting / assembly points that can be used by FDNY and medical help for evacuees.

Emergency vehicle access under the deck would be accommodated and coordinated with FDNY. Siding roads and track crossing sections would be provided for fire safety apparatus and medical emergency vehicles according to existing agreements with local fire departments. Overhead traction power distribution system would be configured to include necessary traction power shutdown for safe operation of vehicles under traction power catenary lines. See Appendix A.7.F for Track Power Areas.

6.06 Other Safety Considerations

The design of Site Fire & Life Safety elements for the space above the overbuild deck will follow the 2014 New York Building and Fire Codes. NFPA 130 will also be applicable to any area that includes passenger terminals and transit ways used for public-occupied trains. However, further safety measures, such as signage, emergency lighting, training, and power sockets are outlined in Appendix A.7.L.

6.07 Ventilation Evaluation for Fire and Diesel Exhaust Hazard Conditions Overbuild

No ventilation systems will be needed for the Public Realm Improvement options, see section 2.01 and Appendix A.7.L for the Ventilation Evaluation.

6.08 Fire Life Safety and Ventilation Systems Sequencing

<u>Subsequent Phases for Deck Construction</u>

Additional phases of deck development would continue after the construction of the Public Realm Improvement options. A ventilation system would likely be needed once an additional phase is built adjacent to the Public Realm Investments phase (See Appendix A.7.M for Future Ventilation Plant Location Plan and Section). The next phase of construction would be a girder type of construction that allows ventilation ducts to be installed between girders in a sequenced fashion.

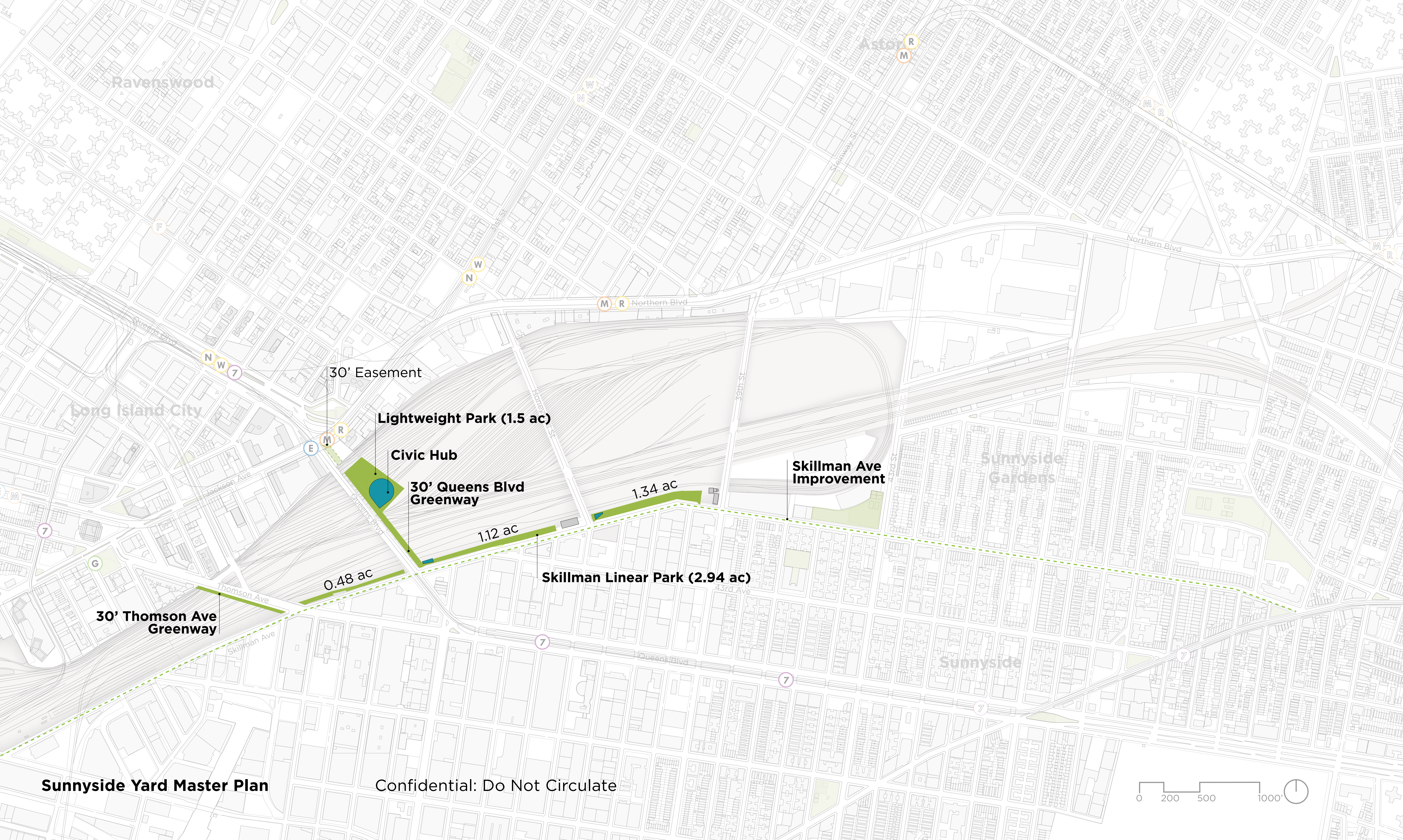
Strips of deck construction aligned with the tracks below would have a maximum installed width of 300 feet based on clause 7.2 of NFPA 502- 2017 to facilitate natural venting through interim openings through the deck prior to the two phases becoming completely enclosed. The ventilation strategy has been confirmed with the 3D CFD analysis (see below). Ventilation plants would be installed while completing the closure construction between the two phases or the construction phase just prior to the deck closure phase with lateral duct plenum connections being completed at interfaces between the phases.

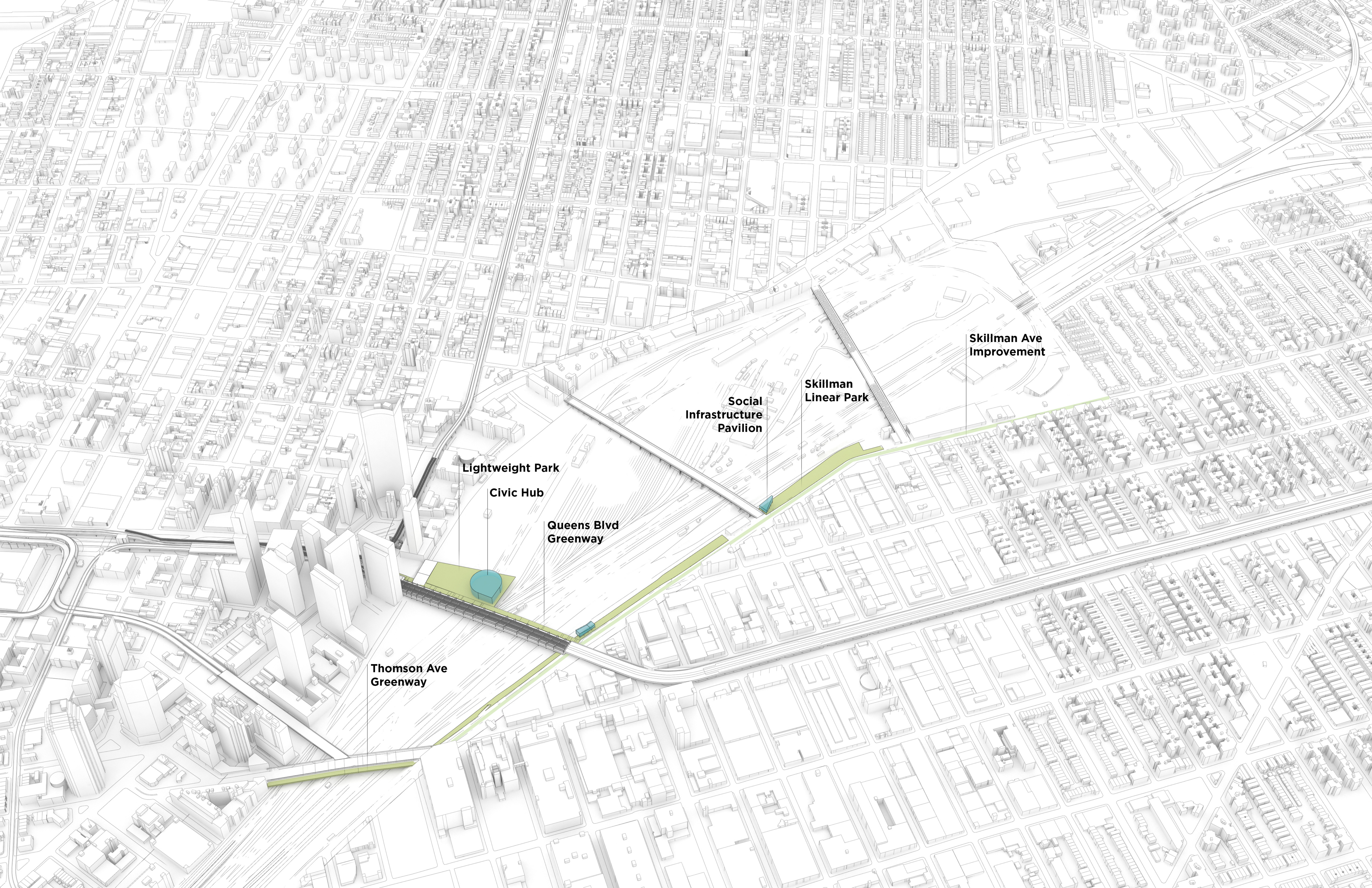
Information about the conducted 3D CFD fire simulation and results can be found in Appendix A.7.L

APPENDIX A.7.A

PHASE PLAN

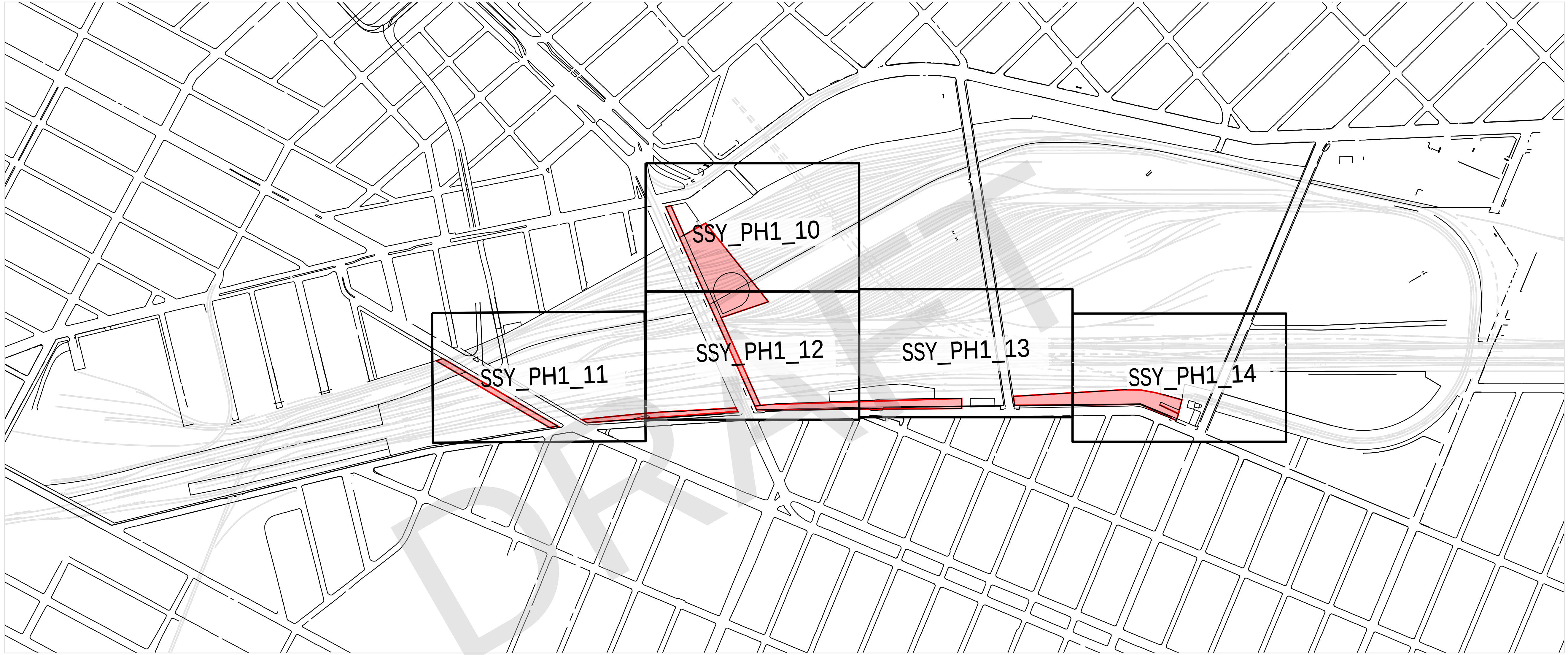
Primer Phase Plan




Skillman Ave
Improvement
Skillman
Linear Park
Social
Infrastructure
Pavilion
Lightweight Park
Civic Hub
Queens Blvd
Greenway
Thomson Ave
Greenway

APPENDIX A.7.B

RAIL SYSTEM IMPACTS



SUNNYSIDE YARD MASTERPLAN
PRIMER PHASE - RAIL SYSTEM IMPACTS

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GENERAL NOTES

1. EXISTING INFORMATION SHOWN IS BASED ON BEST AVAILABLE INFORMATION. THE EXACT LOCATION, SIZE, TYPE, AND ELEVATION OF ANY EXISTING TRACK, UTILITIES, OCS STRUCTURE, SIGNAL STRUCTURE, AERIAL UTILITY CROSSING, UNDERGROUND CABLE ROUTING, DRAINAGE OR ANY OTHER RAIL FACILITY OR STRUCTURE SHOULD BE FIELD VERIFIED.
2. OCS AND AERIAL CROSSING STRUCTURES DIRECTLY IMPACTED BY THE DECK ARE LISTED. ADJACENT OCS STRUCTURES ON EITHER SIDE OF THE DECK FOOTPRINT WILL BE IMPACTED DUE THE RELOCATION AND REPROFILING OF THE WIRES.
3. A NY CALL ONE SHALL BE DONE PRIOR TO ANY EXCAVATION AND REQUEST TO AMTRAK TO FIELD MARK AND LOCATE THEIR UNDERGROUND UTILITIES.
4. AMTRAK WILL REQUIRE HAND DIGGING TO A SPECIFIED DEPTH SHOULD THEIR CABLES BE NEAR ANY FOUNDATION EXCAVATION. TEST PITS WILL BE REQUIRED FOR CONFIRMATION OF UTILITY ROUTING.
5. HIGH WATER TABLE WILL PRESENT CHALLENGES TO RELOCATE AERIAL CONDUCTORS UNDERGROUND IN WATER PROOF DUCKBANKS AND MANHOLES.
6. ACCESS PLATFORM FOR QUEENS BOULEVARD WILL NEED TO BE ACCESSIBLE DURING CONSTRUCTION OR ALTERNATE MEANS FOR ACCESS WILL BE REQUIRED FROM QUEENS BOULEVARD.

LEGEND

OCS STRUCTURES AND SIGNAL BRIDGES

OCS WIRES

TRACTION AND SIGNAL POWER FEEDERS

STATIC WIRE

PROPOSED COLUMNS

PRIMER PHASE OVERBUILD

X TRACK LEVEL PHOTO

ABBREVIATIONS

OCS	OVERHEAD CONTACT SYSTEM
CIH	CENTRAL INSTRUMENTATION HOUSE
CIL	CENTRAL INSTRUMENT LOCATION
CAM	CAR APPEARANCE MAINTENANCE

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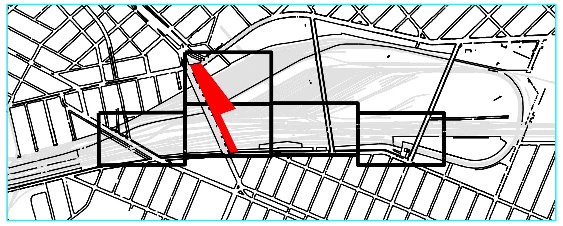
RAIL IMPACTS

1. BRIDGE WIDENING OVER THOMSON AVE. BRIDGE (see General Notes)

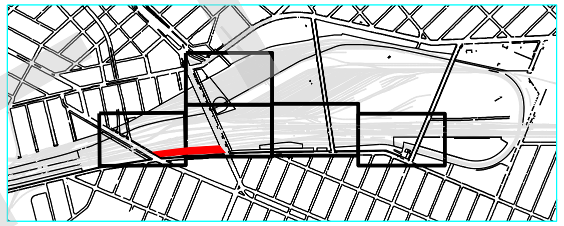
- OCS structures: B-911W, B-911WS, B-911 1/4EA, B-910EA and B-911CW.
- OCS wires: #Sub4, #Sub3, #4, #2, #723, #Sub2, #Sub1, #HM, #3, #107, #231, #1A, #741 and #743.
- Traction power circuits: #4302, #4304 and #4301.
- Signal power circuits (2 cables per circuit): #122, #125, #123 and #124.
- Cross track feeders at B-910EA and B-911W.
- Static wires.
- Future CIL MID-1.
- Control House F2 CIH.
- Communications, signals and traction power ductbanks and troughs
- Drainage and storm sewers.
- Aerial communication cables installed on wood poles along Skillman Ave.

2. BRIDGE WIDENING OVER QUEENS BLVD. BRIDE AND EXTENDED AREA OVER MIDDAY YARD (see General Notes)



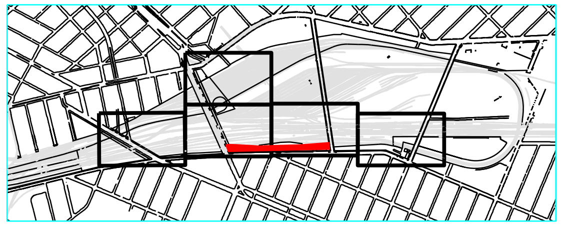
- Overhead cross catenary lights over Midday Yard
- CAM platforms.
- OCS Structures: B-918W, B-918 1/2N, B-917 3/4W, Tower 9, B-915 2/3DE, B-915 2/3BE, B-915 2/3CE and B-915EEA.
- OCS Wires: #Sub4, #ETXO, #106, #Sub2, #1 (bowl), #3, #4, #5, #7, #103, #104, #14, #102, #105, #20, #7, #5, #4 (main), #2 (main), #121B, #231, #825, #3A, #741A, #741B, #1A, #36C, #16D and #11.
- Traction power circuits: #445A, #444, #4302, #4304 and #4301.
- Signal power circuits (2 cables per circuit): #122, #125, #123 and #124.
- QB1-QB2 Signal and Comms overhead crossing over Westbound Bypass, Westward LI passenger and LI Freight tracks.
- QB3-QB4 Signal and Comms overhead crossing over the Bowl Tracks (Q-Tower).
- Utility cables overhead crossing over Loop Tracks.
- Personnel access platform/stair tower from the bridge located between the Bowl Tracks and the North Runner track.
- Future Sunnyside Station.
- Access road.
- Communications, signals sand traction power ductbanks and troughs.
- Drainage and storm sewers.
- Aerial communication cables installed on wood poles along Skillman Ave.

3. LINEAR PARK ALONG SKILLMAN AVE. (BETWEEN THOMSON AND QUEENS BLVD. BRIDGES) (see General Notes)



- OCS Structures: B-914E, B-914EC, B-914ED and B-915E.
- Traction power circuits: #4304 and #4301.
- Signal power circuits (2 cables per circuit): #123 and #124.
- Access ramp and road.
- Signal power circuit #123 running underground along the access road under Queens Boulevard bridge from structures B-915E to B-916EC.
- Aerial communication cables installed on wood poles along Skillman Ave.

4. LINEAR PARK ALONG SKILLMAN AVE. (BETWEEN QUEENS BLVD. AND HONEYWELL BRIDGES) (see General Notes)



- OCS Structures: B-916EC, B-917EC, B-917ED, B-917EF, B-918E, B-918EA, B-919E, B-919ELA and B-919AL.

NOTE:

1. All identified circuits are based upon information taken from existing prints. Field verifications must be done.

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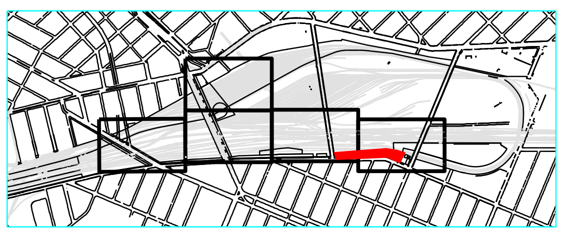
- OCS Wires: #11, #36B and #16C.
- OCS Structures: B-916EC, B-917EC, B-917ED, B-917EF, B-918E, B-918EA, B-919E, B-919ELA and B-919AL.
- OCS Wires: #11, #36B and #16C.
- Cross track feeders at B-918EA, B-919E and B-919ELA.
- Traction power circuits: #4304 and #4301.
- Signal power circuits (2 cables per circuit): #123 and #124.
- LIRR Aerial Power Crossing HP3/HP4.
- Aerial Power Crossing (26.4kV).
- Signal Bridge E34.
- Static wires.
- Access road.
- Aerial communication cables installed on wood poles along Skillman Ave.
- LIRR Substation G02A.
- Underground utilities.

5. LINEAR PARK ALONG SKILLMAN AVE. (BETWEEN HONEYWELL AVE. AND 39TH STREET BRIDGES (see General Notes)



- OCS Structures: B-924E, B-925E, B-925EA and B-926E (some OCS structures are part of East Side Access scope of work and have not been constructed yet).
- OCS Wires: #11, #11A, #91 and #16A (some OCS wires are part of East Side Access scope of work and and have not been installed yet).
- Cross track feeders at B-925E and B-926E.
- HP3/HP4 LIRR power crossing.
- 26.4kV aerial and underground power crossing.
- Static wire.
- Access ramp and road.
- Wood utility poles.
- Drainage and storm sewers.
- Underground utilities.
- Car wash expansion.

NOTE:

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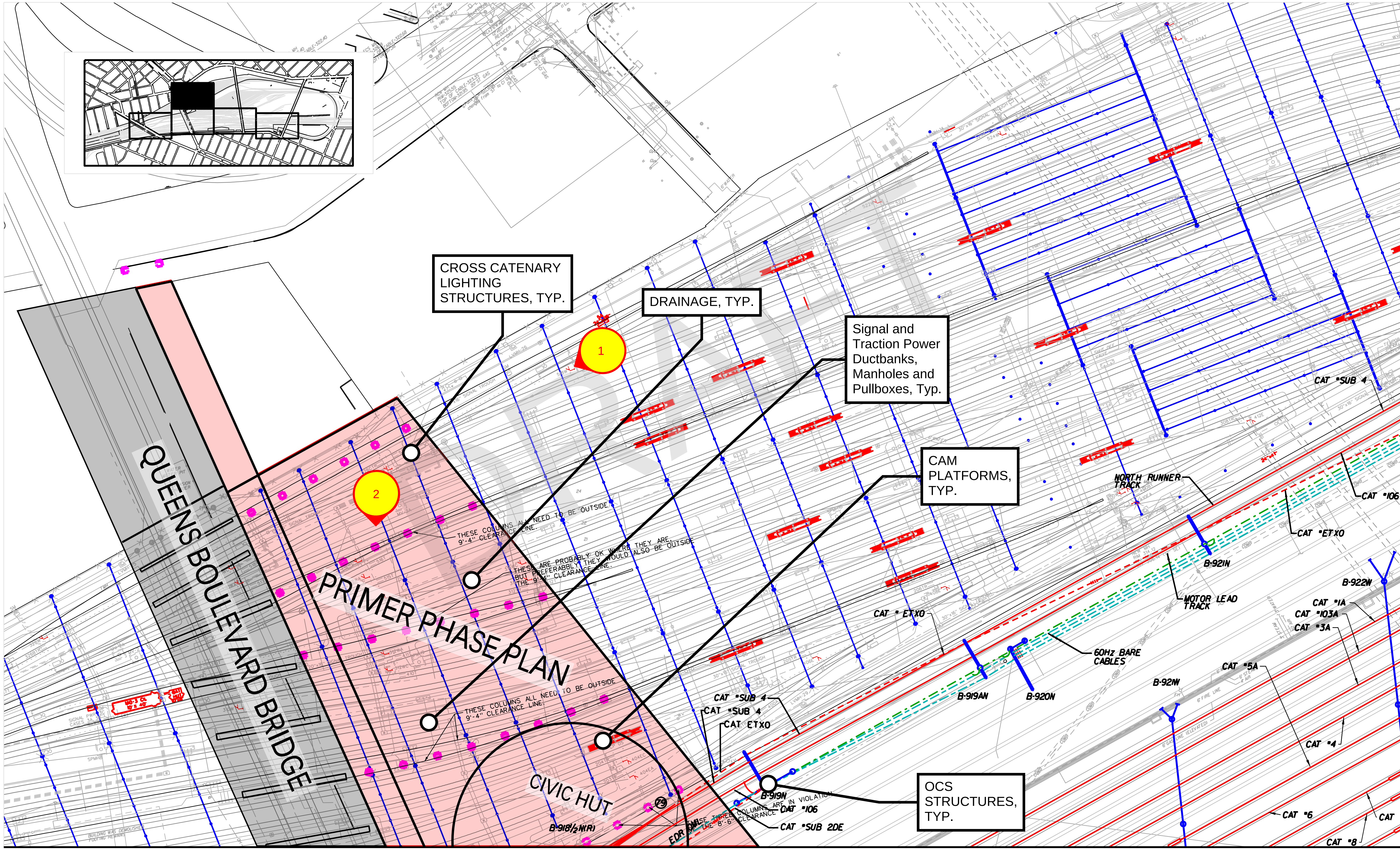

MATCHLINE SSY_PH1_12

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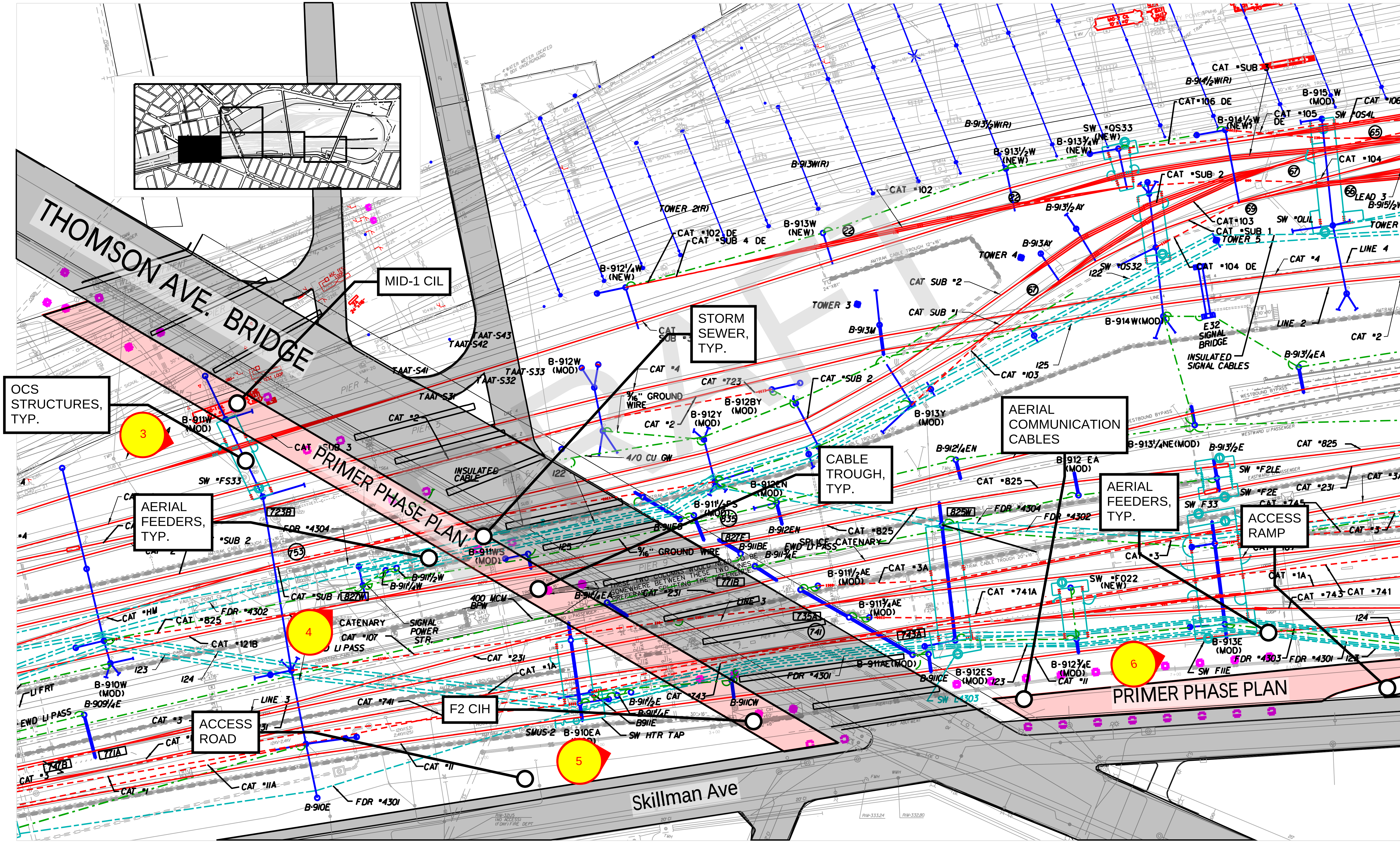

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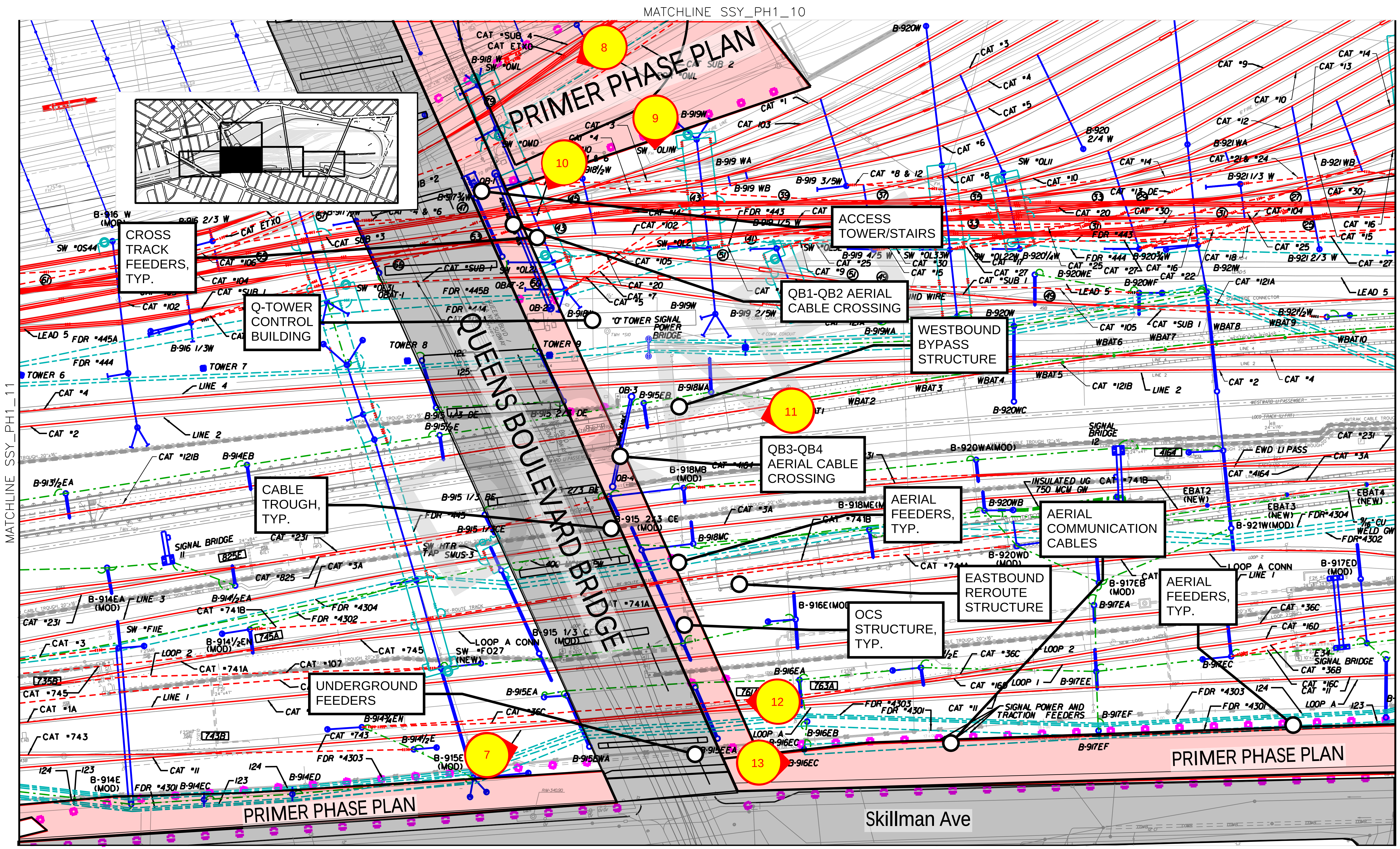

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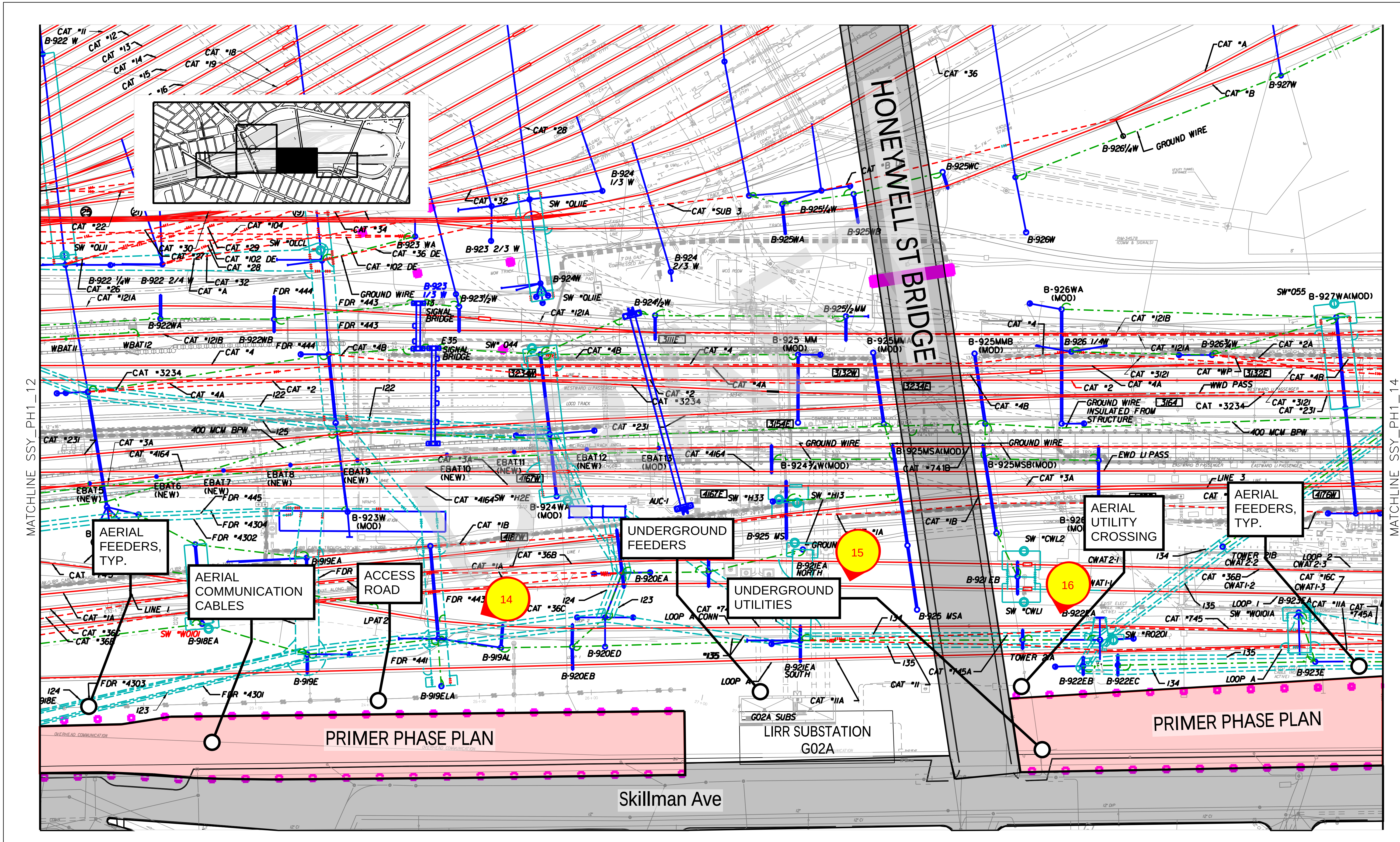

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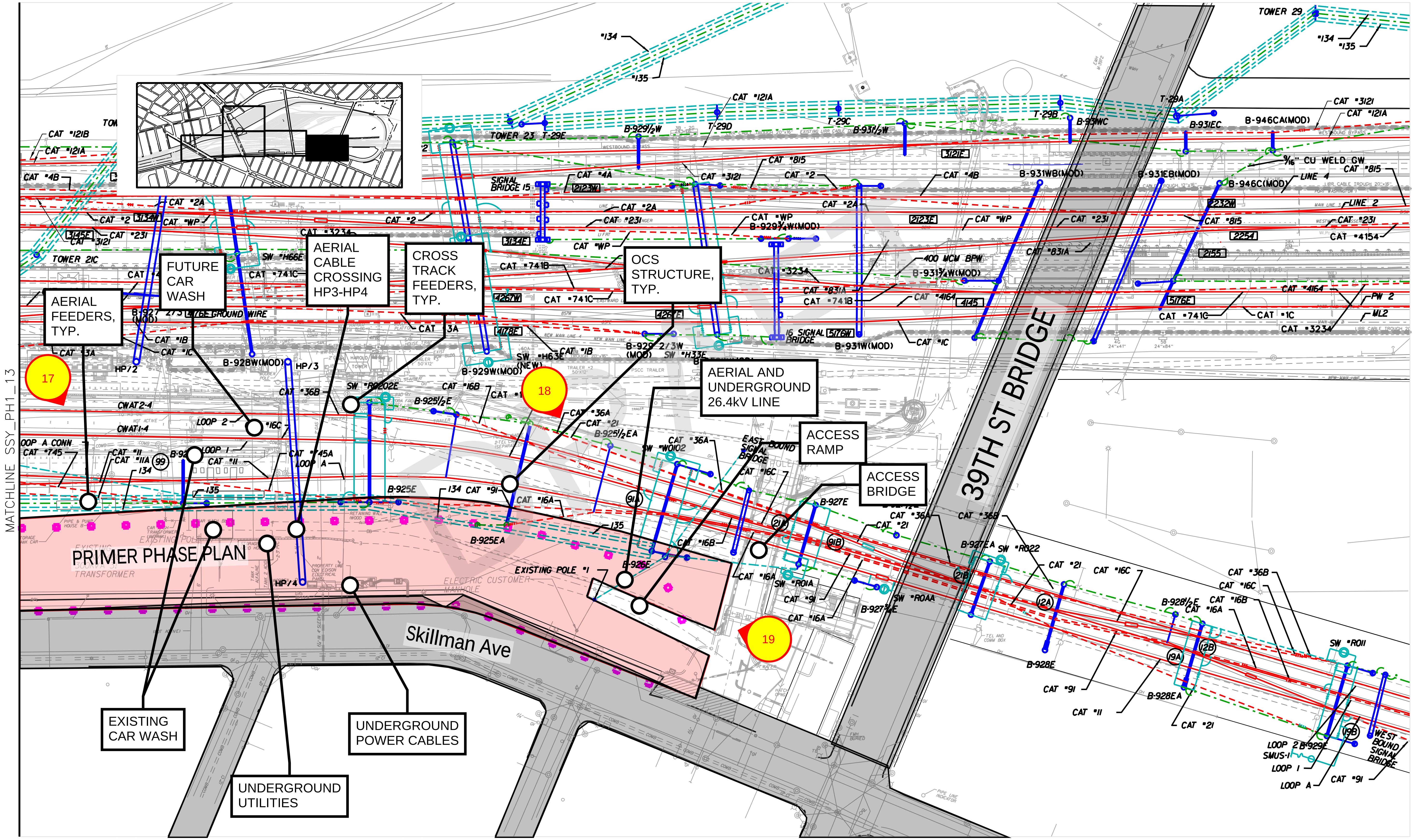

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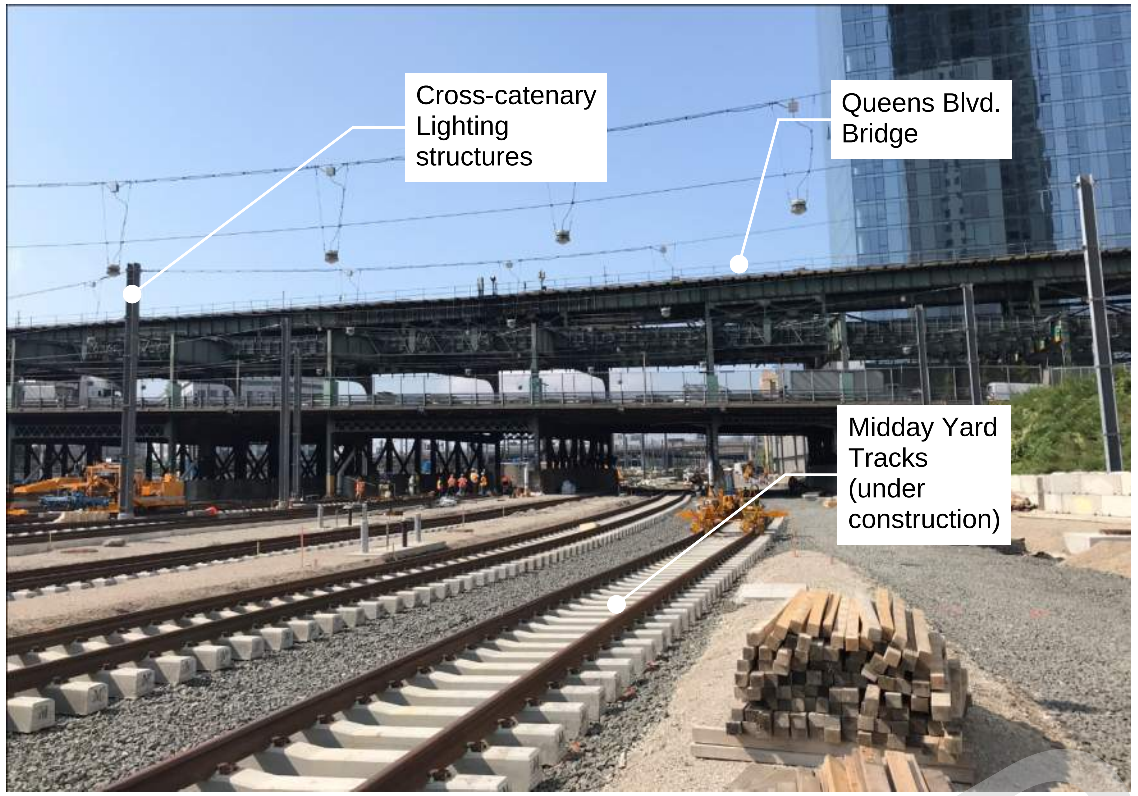

Photo 1 - Midday Yard (Under Construction)

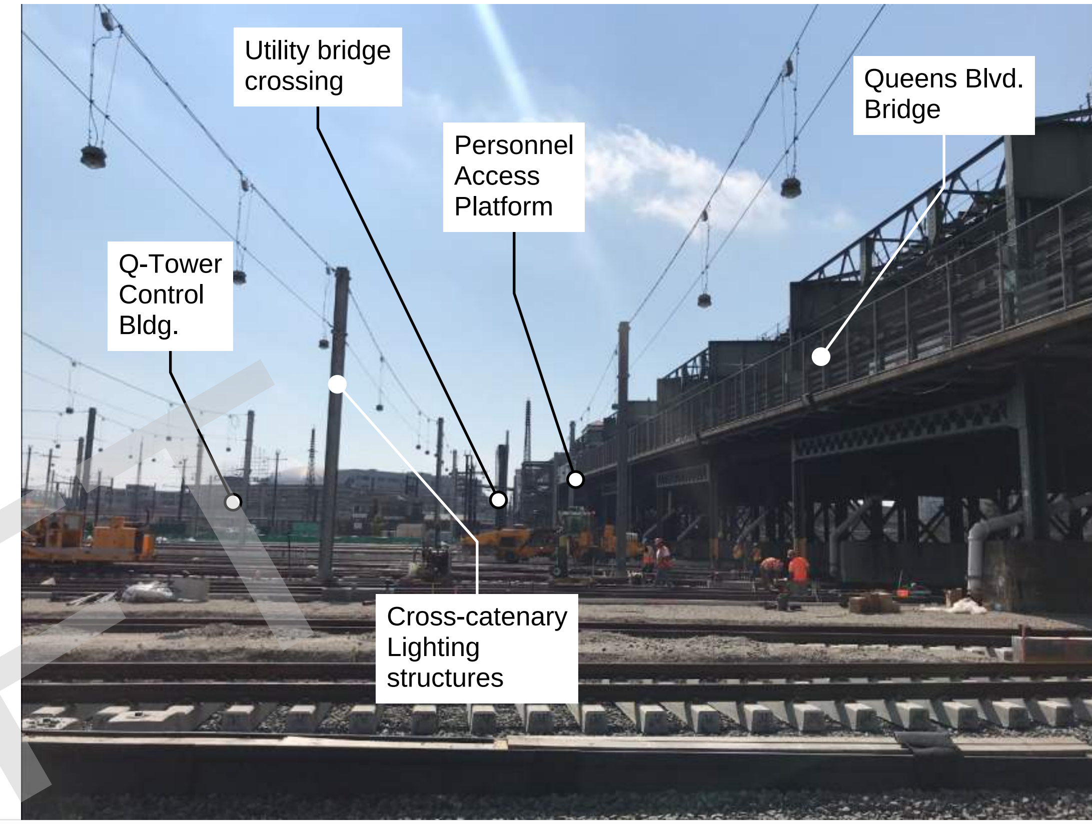

Photo 2 - Midday Yard (Under Construction)

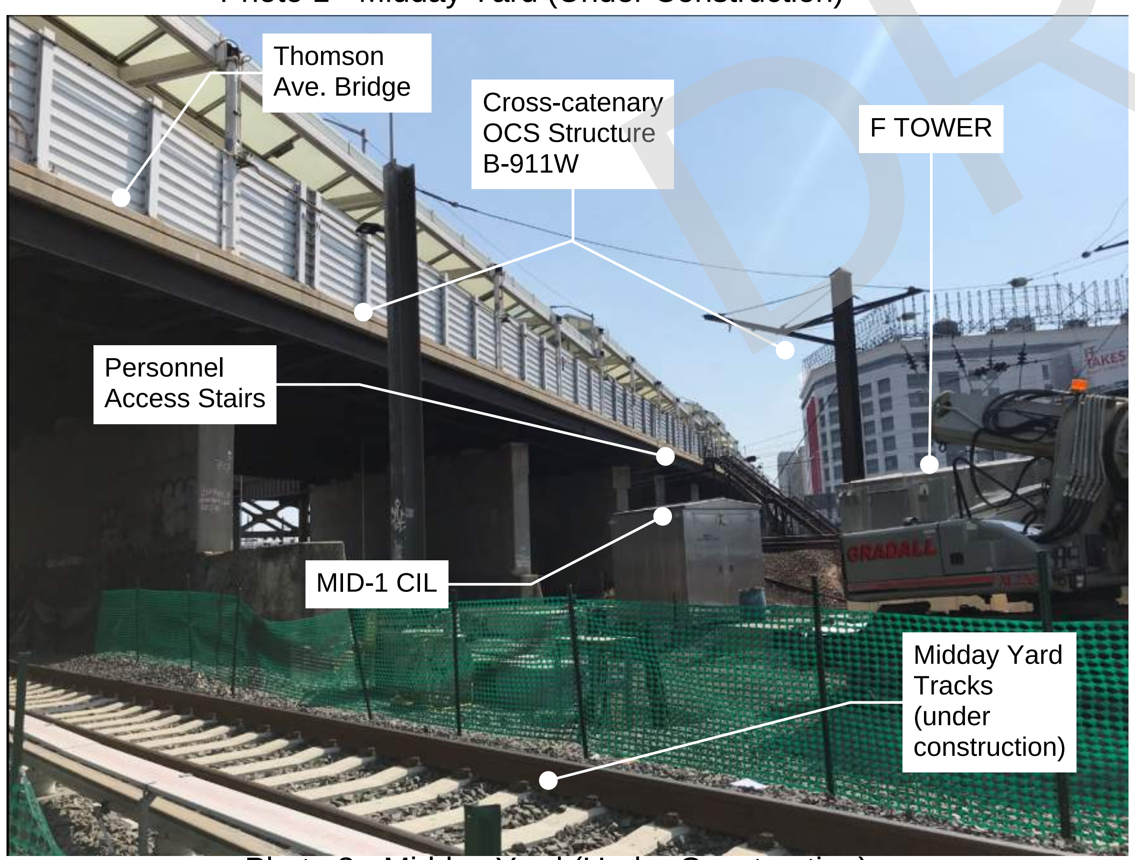

Photo 3 - Midday Yard (Under Construction)

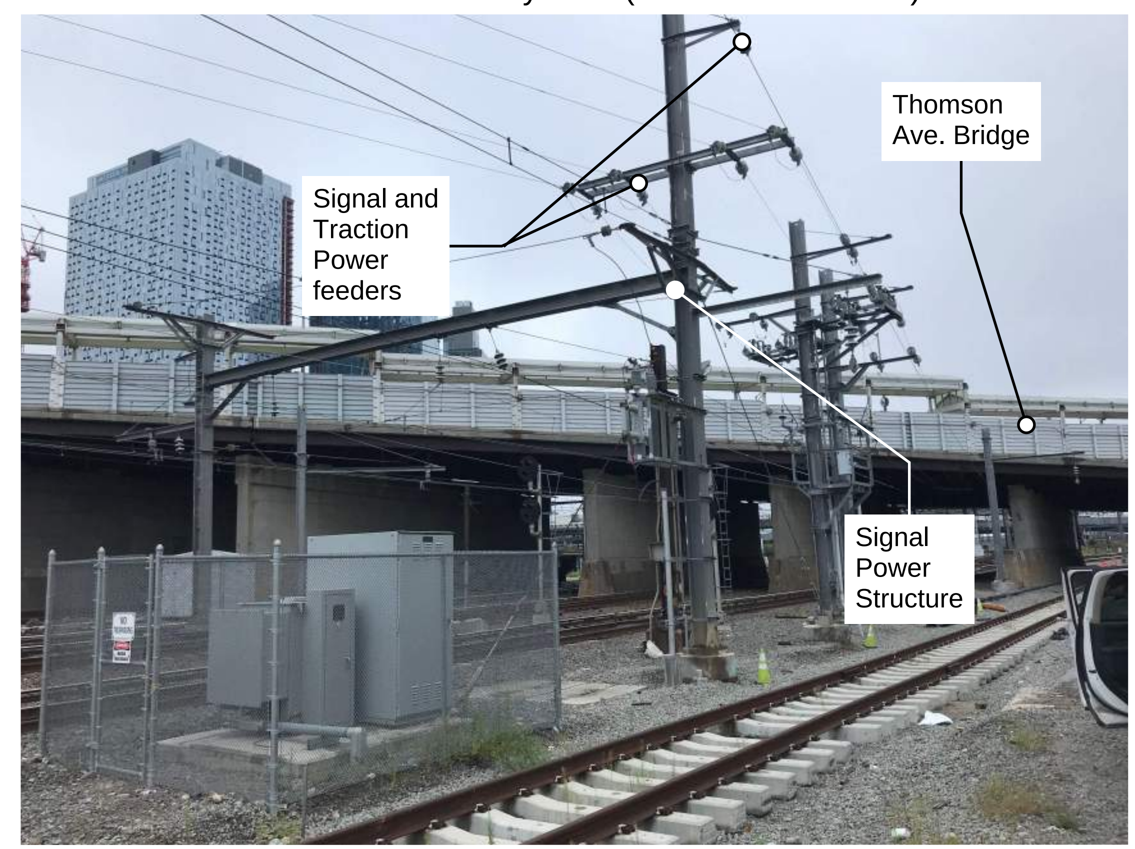

Photo 4 - Feeders across Thomson Ave. Bridge

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SUNNYSIDE YARD MASTERPLAN
PRIMER PHASE – RAIL SYSTEM IMPACTS

SCALE: NTS
FILE NAME: SSY_PH1_20
REV. NO.

CONTRACT NO. –
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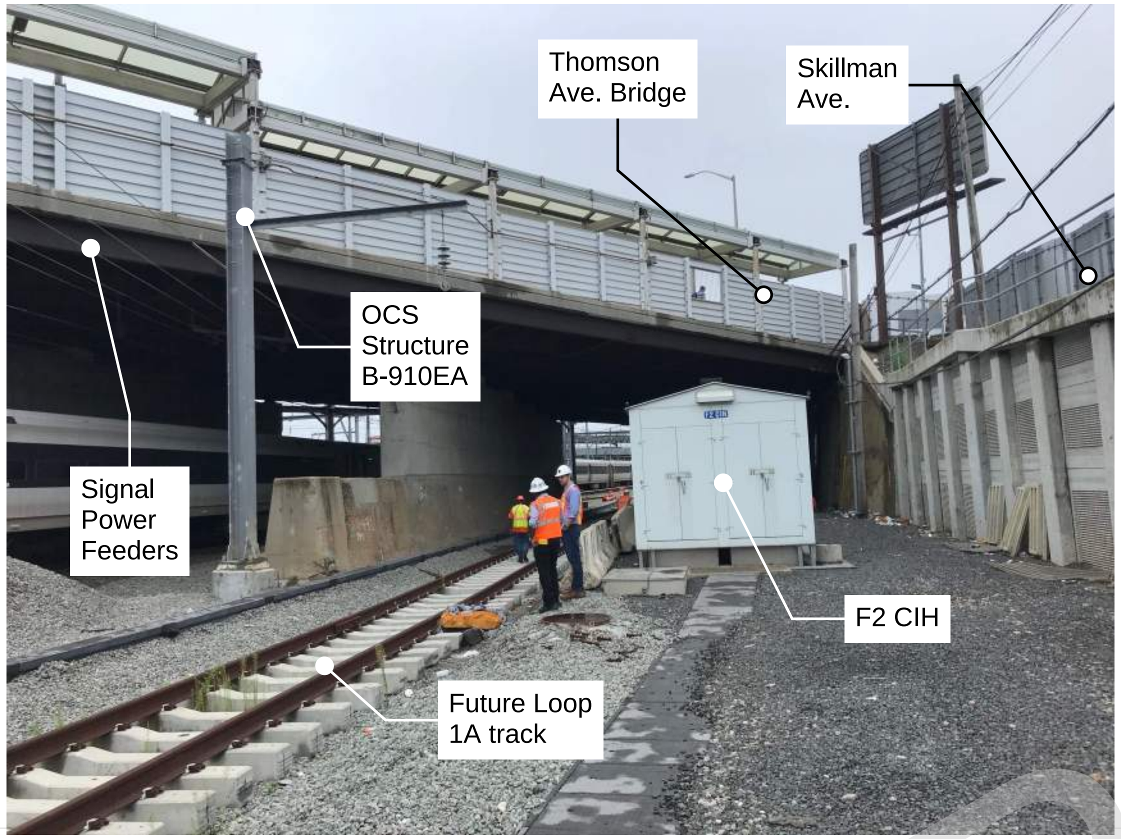

Photo 5 - F2 CIH near Thomson Ave. Bridge

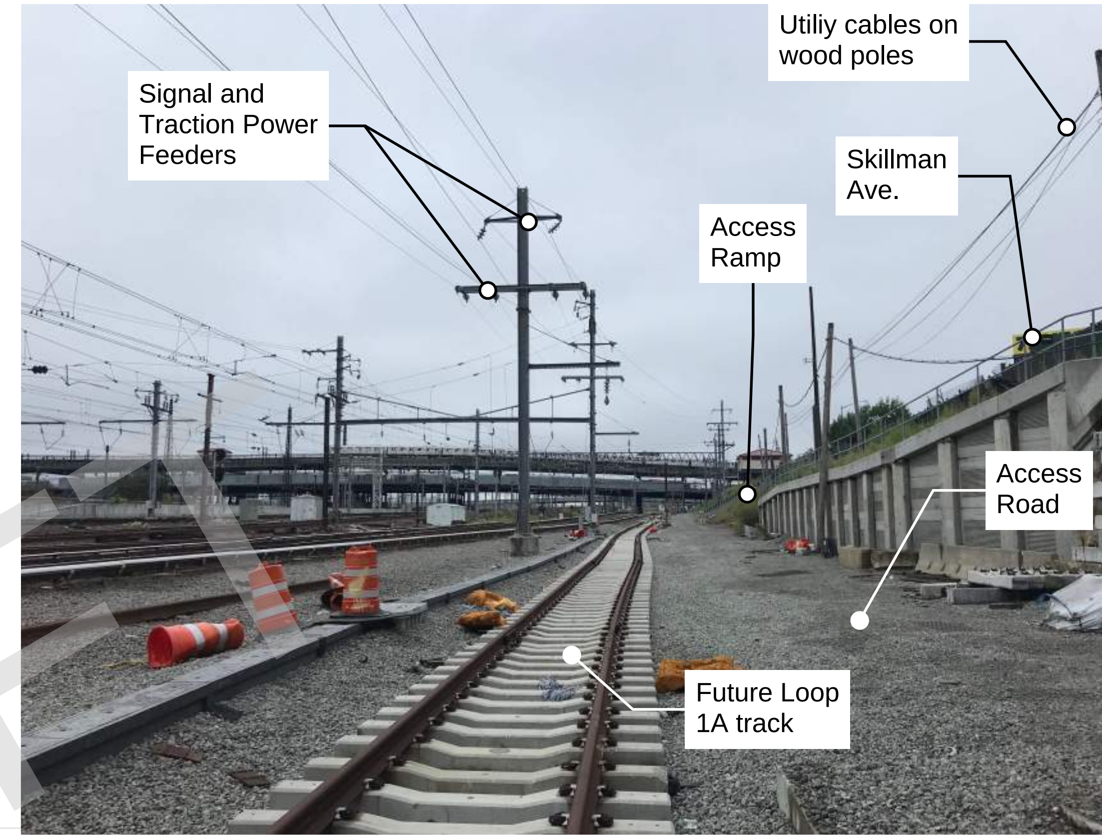

Photo 6 - Access Road between Thomson and Queens Blvd.

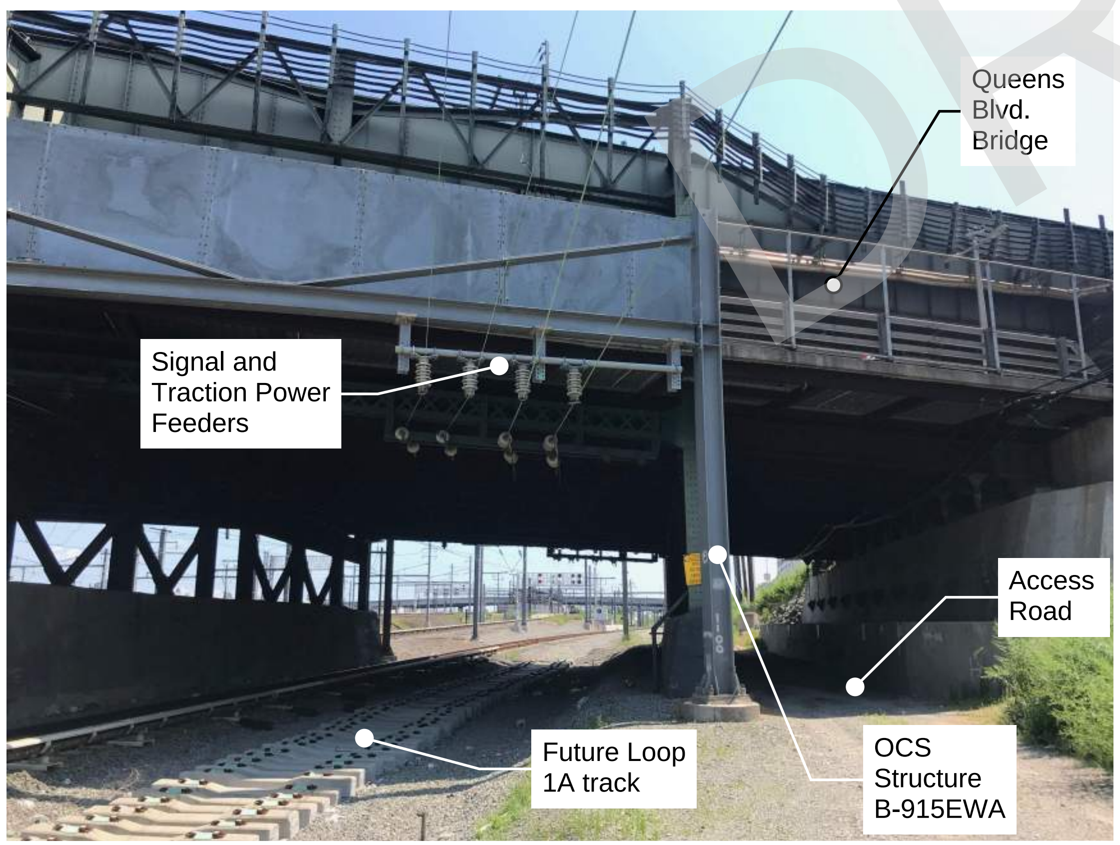

Photo 7 -Feeders crossing under Queens Blvd.

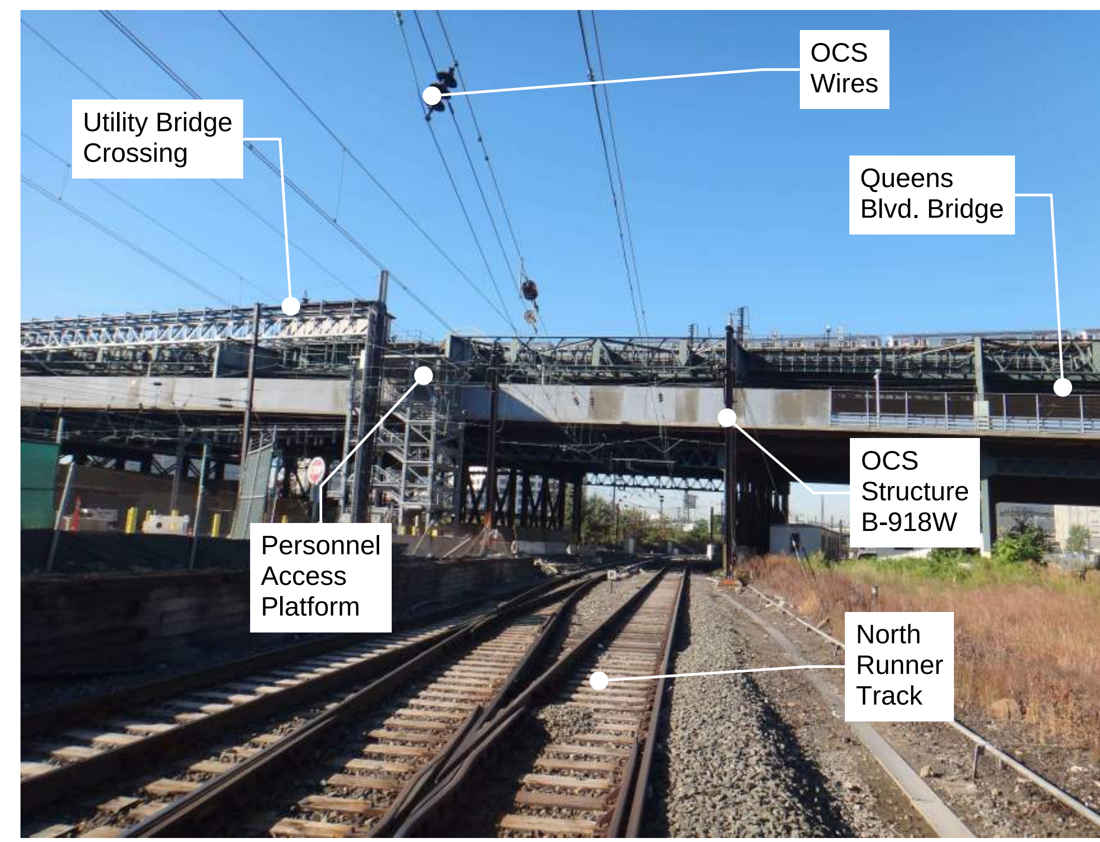

Photo 8 -OCS wires crossing under Queens Blvd.

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PRIMER PHASE – RAIL SYSTEM IMPACTS

SCALE: NTS
FILE NAME: SSY_PH1_21
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SHEET 11 OF 14

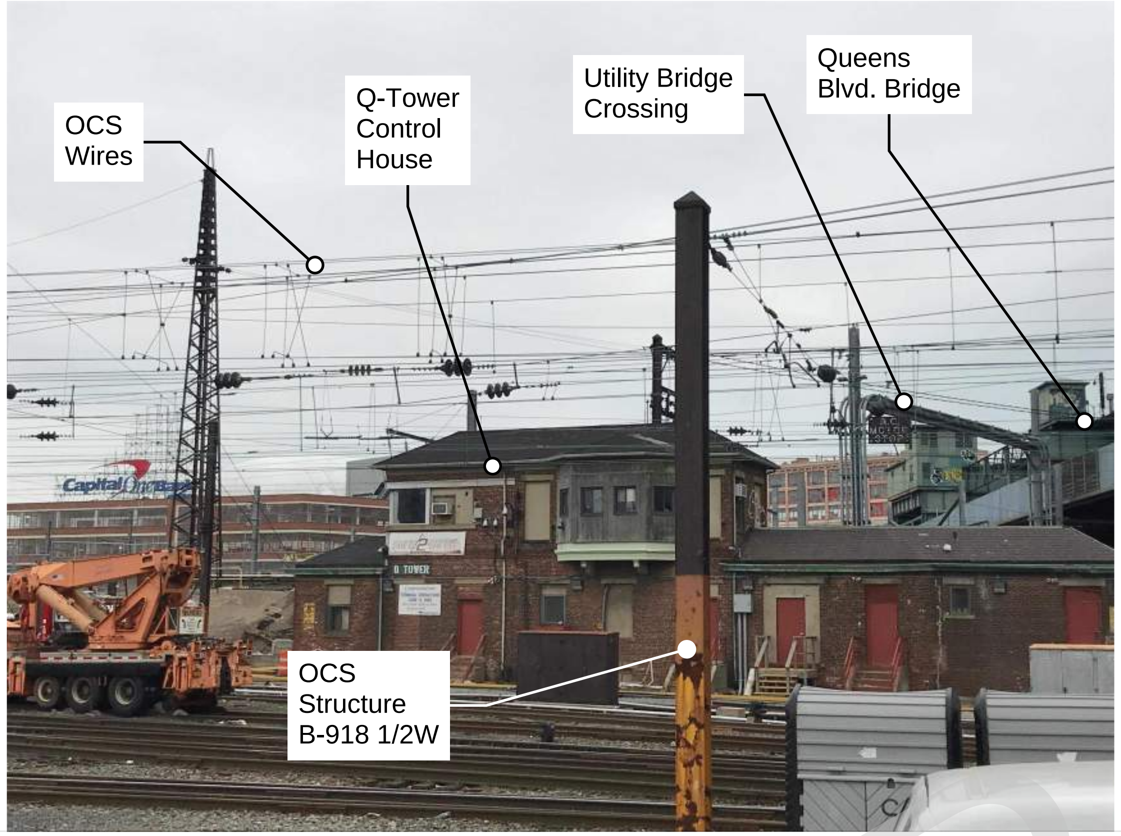

Photo 9 - Q-Tower

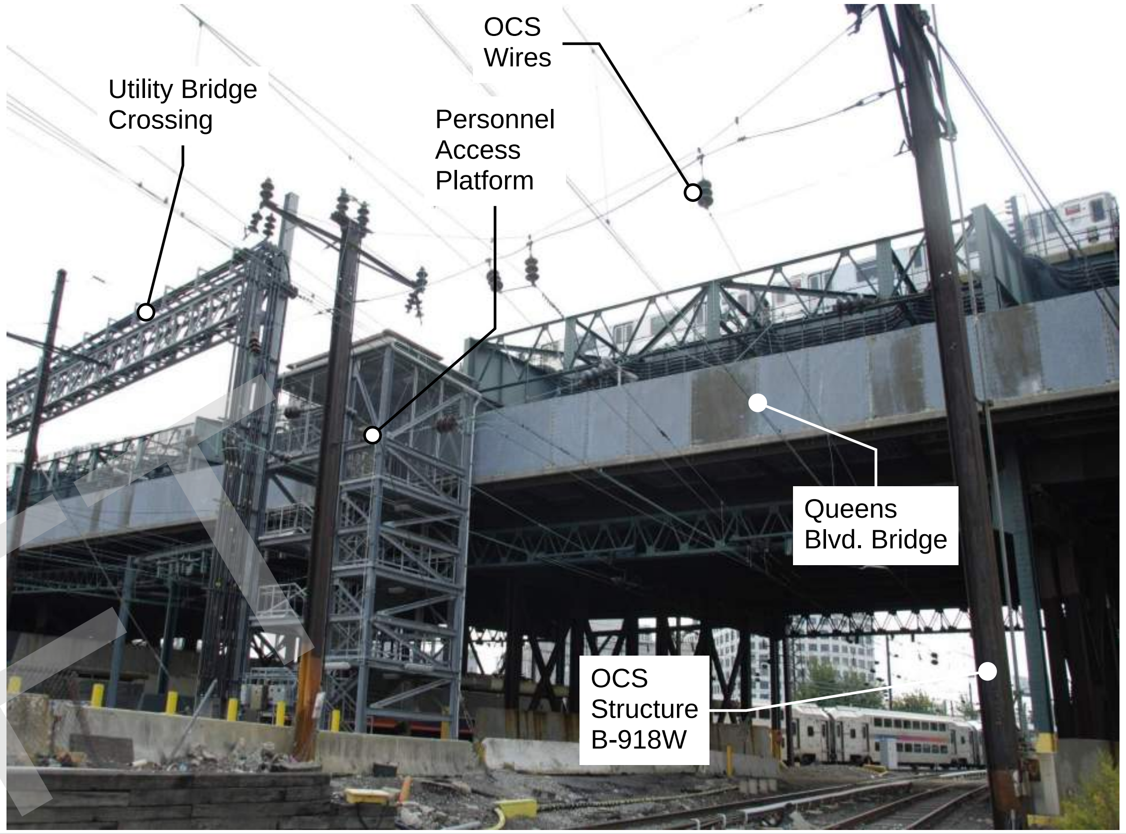

Photo 10 - Utility Crossing Bridge

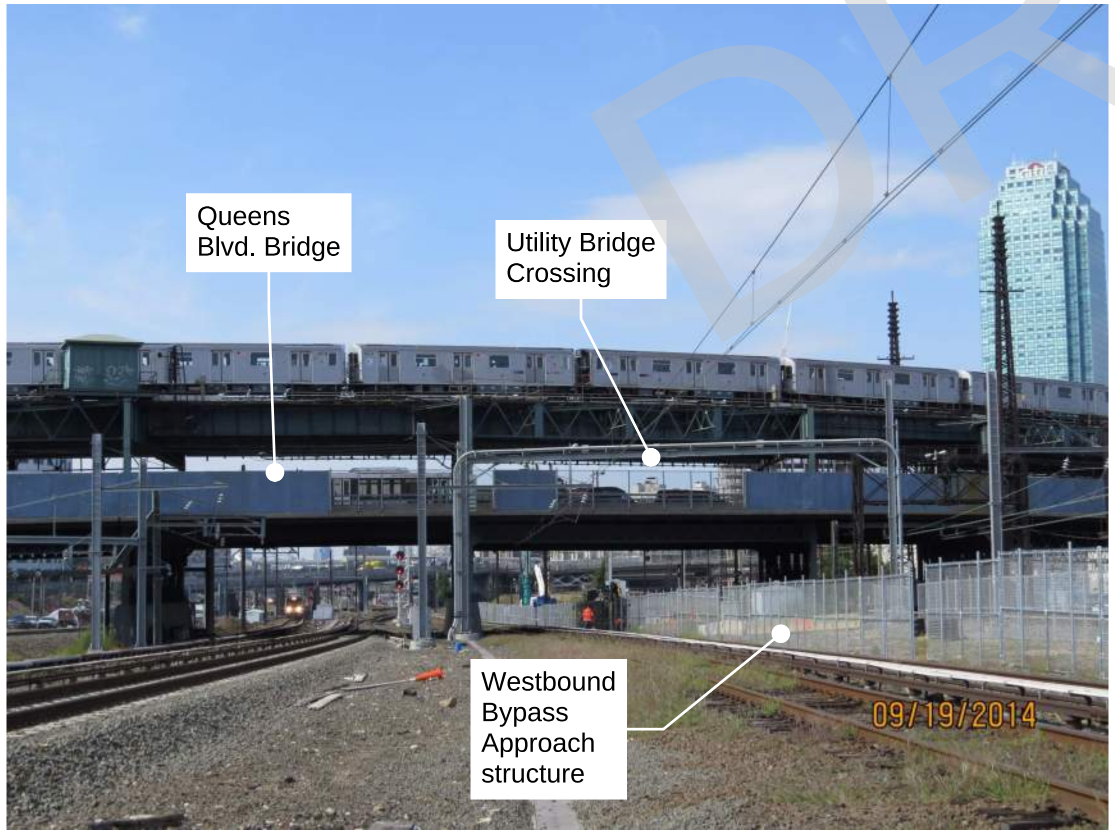

Photo 11 - Aerial Utility Crossing

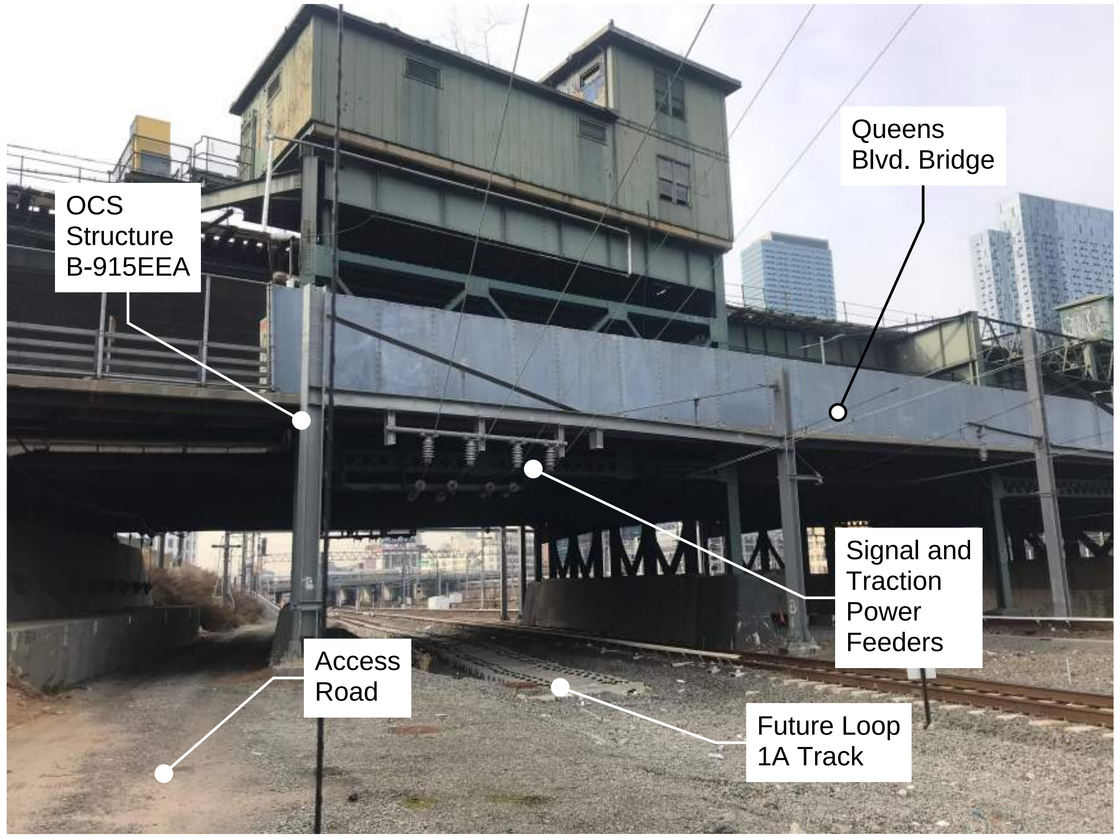

Photo 12 - Feeder Crossing under Queens Blvd.

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PRIMER PHASE – RAIL SYSTEM IMPACTS

SCALE: NTS
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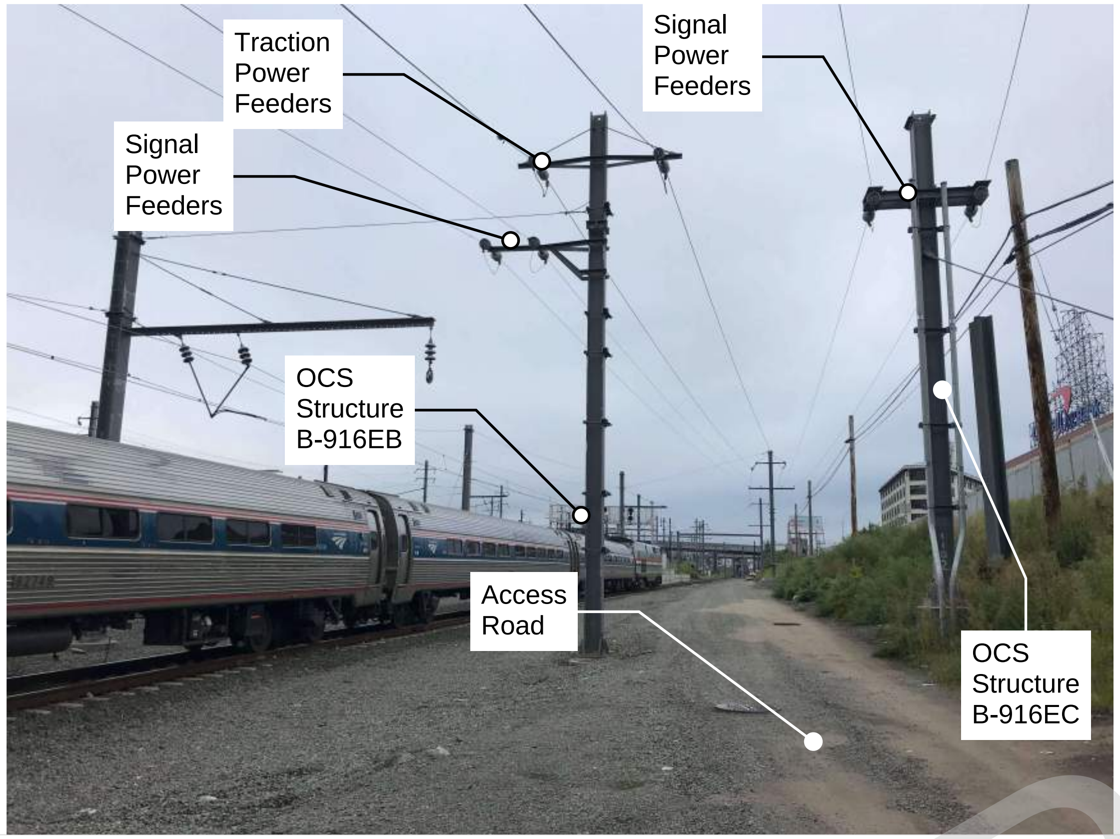

Photo 13 - Access Road between Queens Blvd. and 39th St.

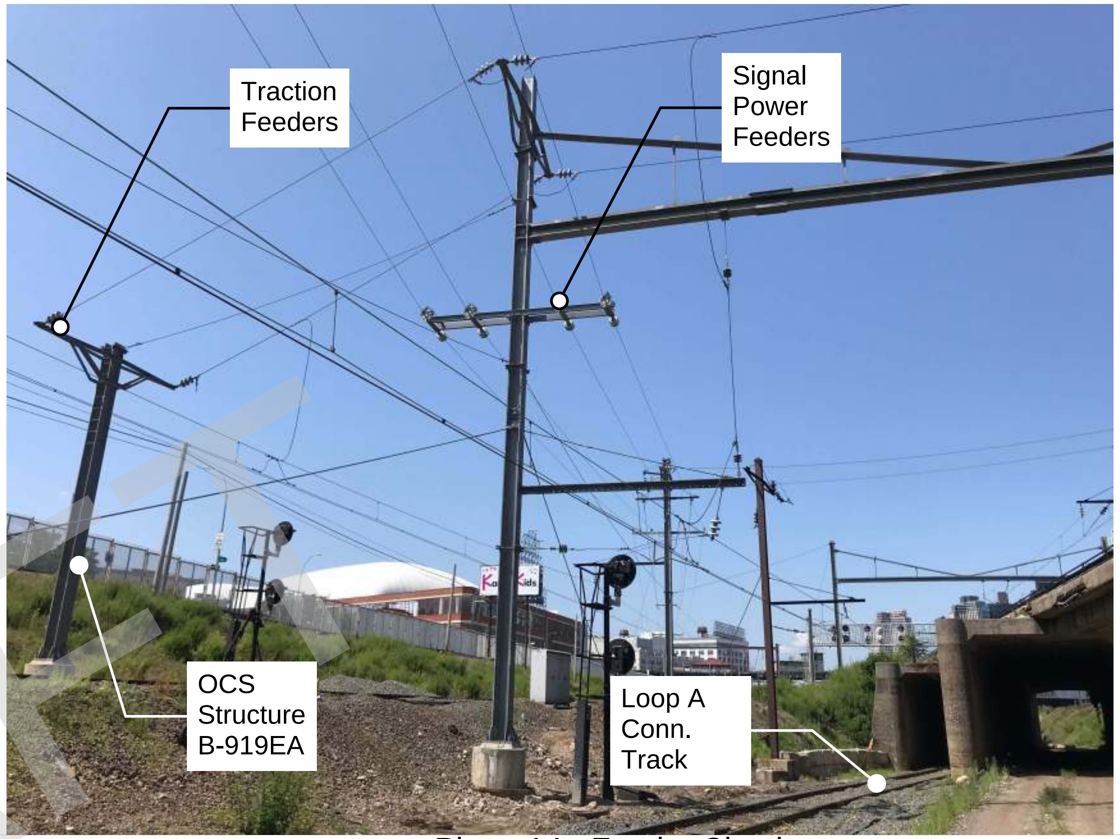

Photo 14 - Feeder Circuits

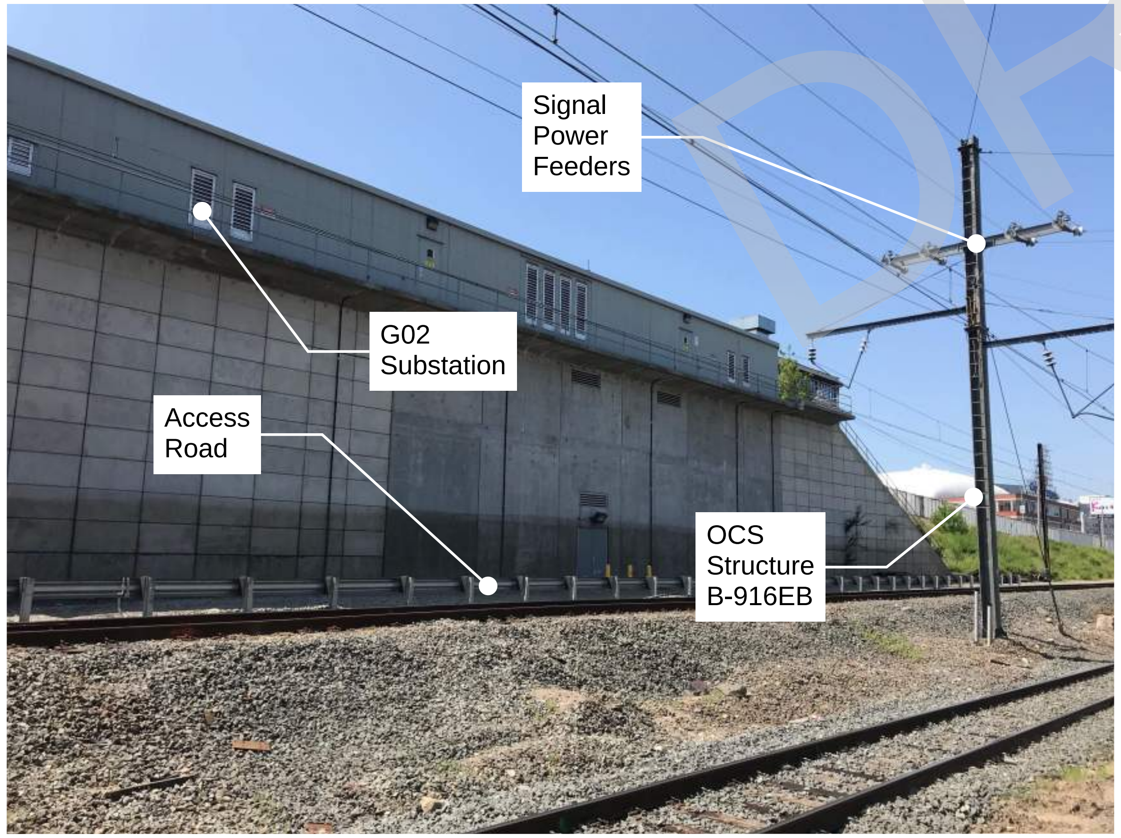

Photo 15 - LIRR G02A Substation

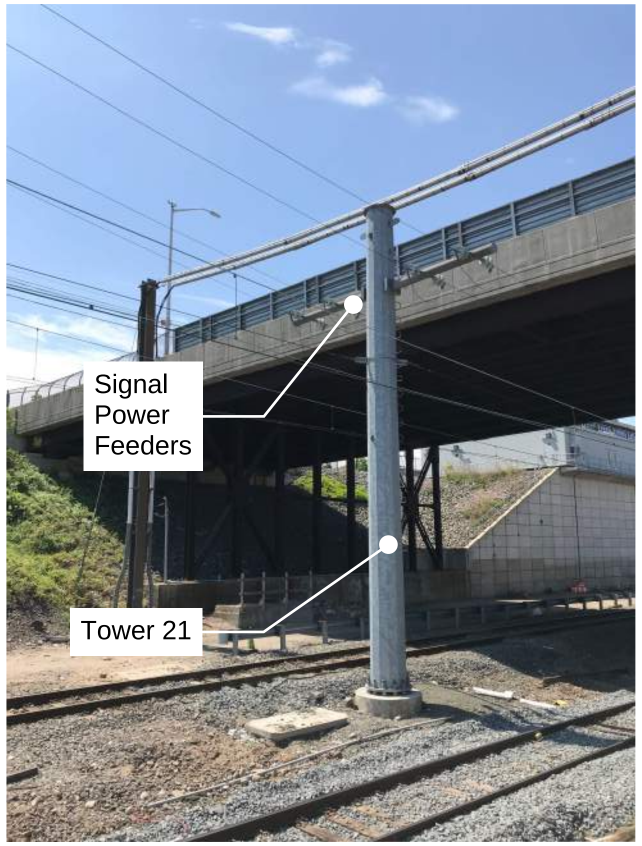

Photo 16 - Feeder circuits

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PRIMER PHASE – RAIL SYSTEM IMPACTS

SCALE: NTS
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REV. NO.

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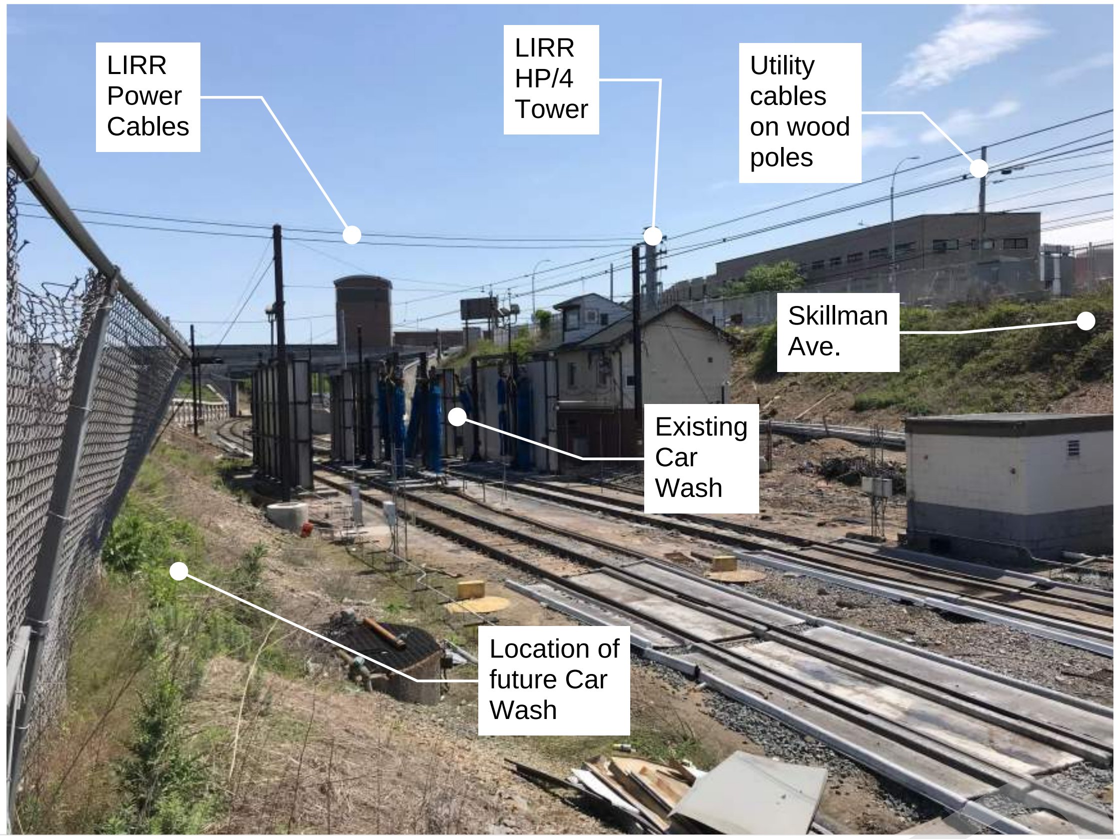

Photo 17 - Feeders between Queens Blvd. and 39th St.

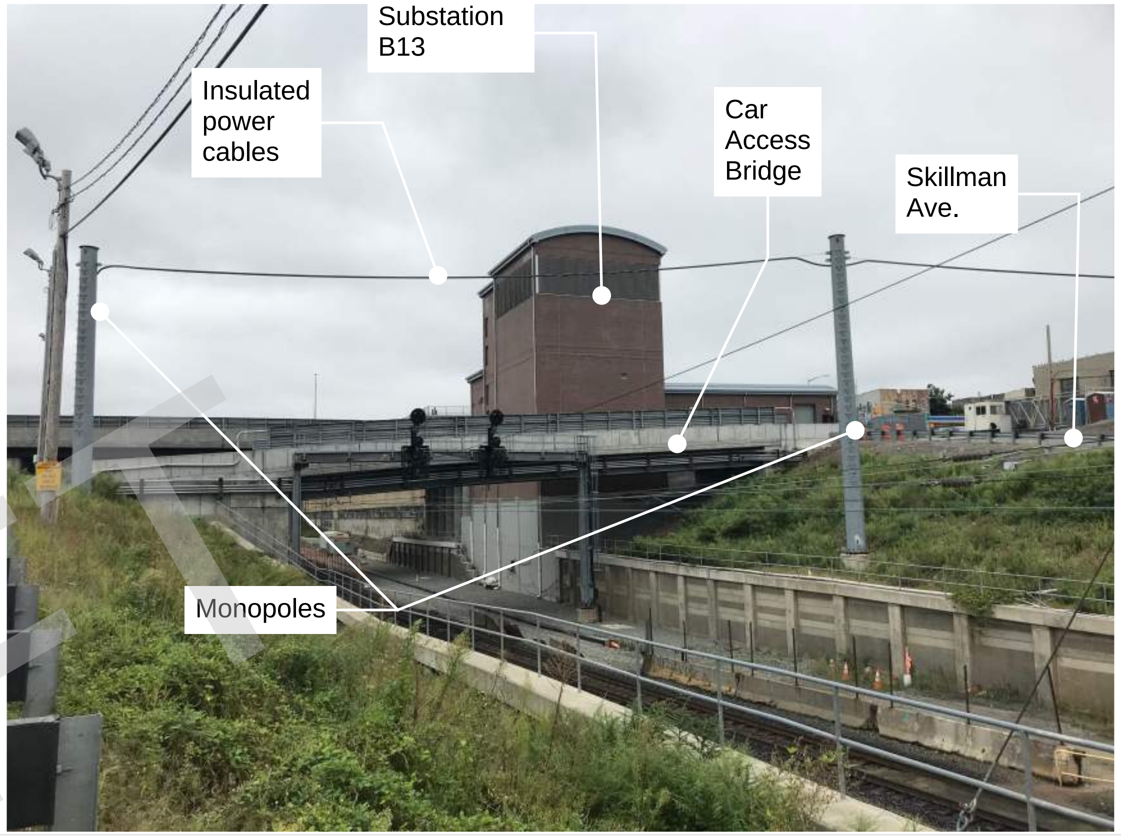

Photo 18 - Power Monopoles

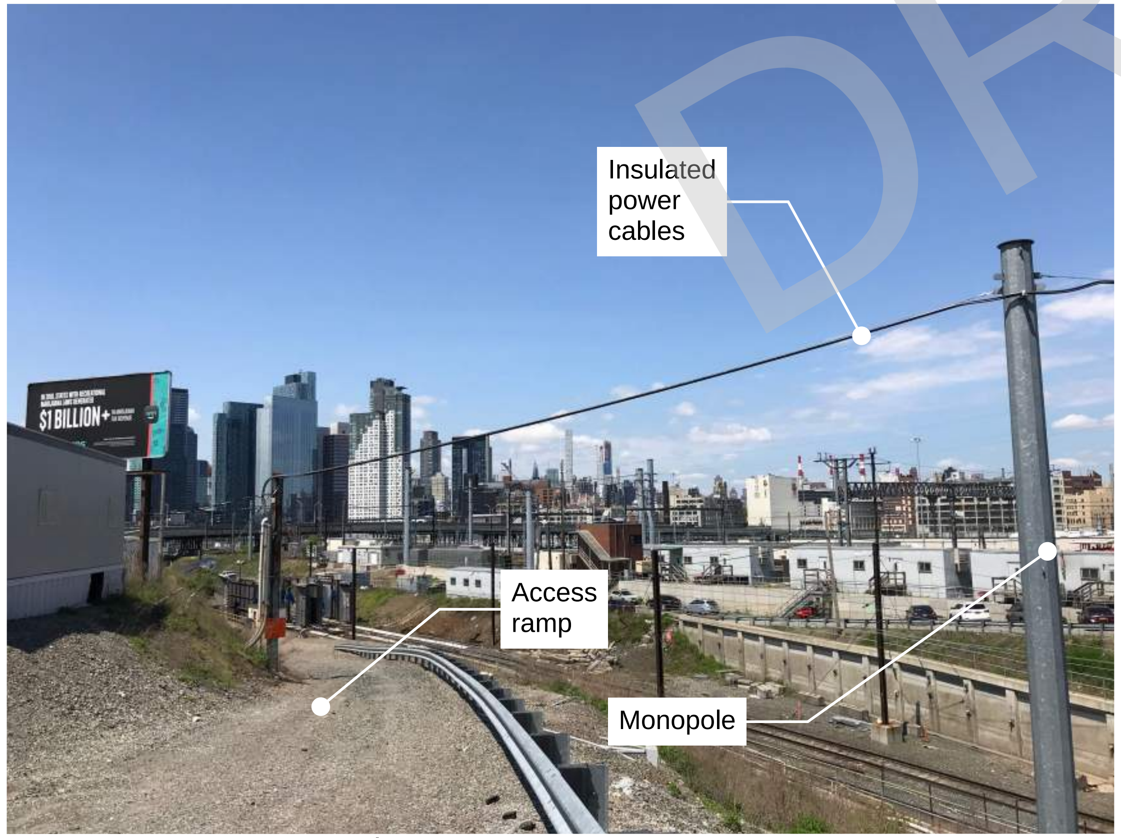

Photo 19 - Access Ramp

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SUNNYSIDE YARD MASTERPLAN
PRIMER PHASE – RAIL SYSTEM IMPACTS

SCALE: NTS
FILE NAME: SSY_PH1_24
REV. NO.

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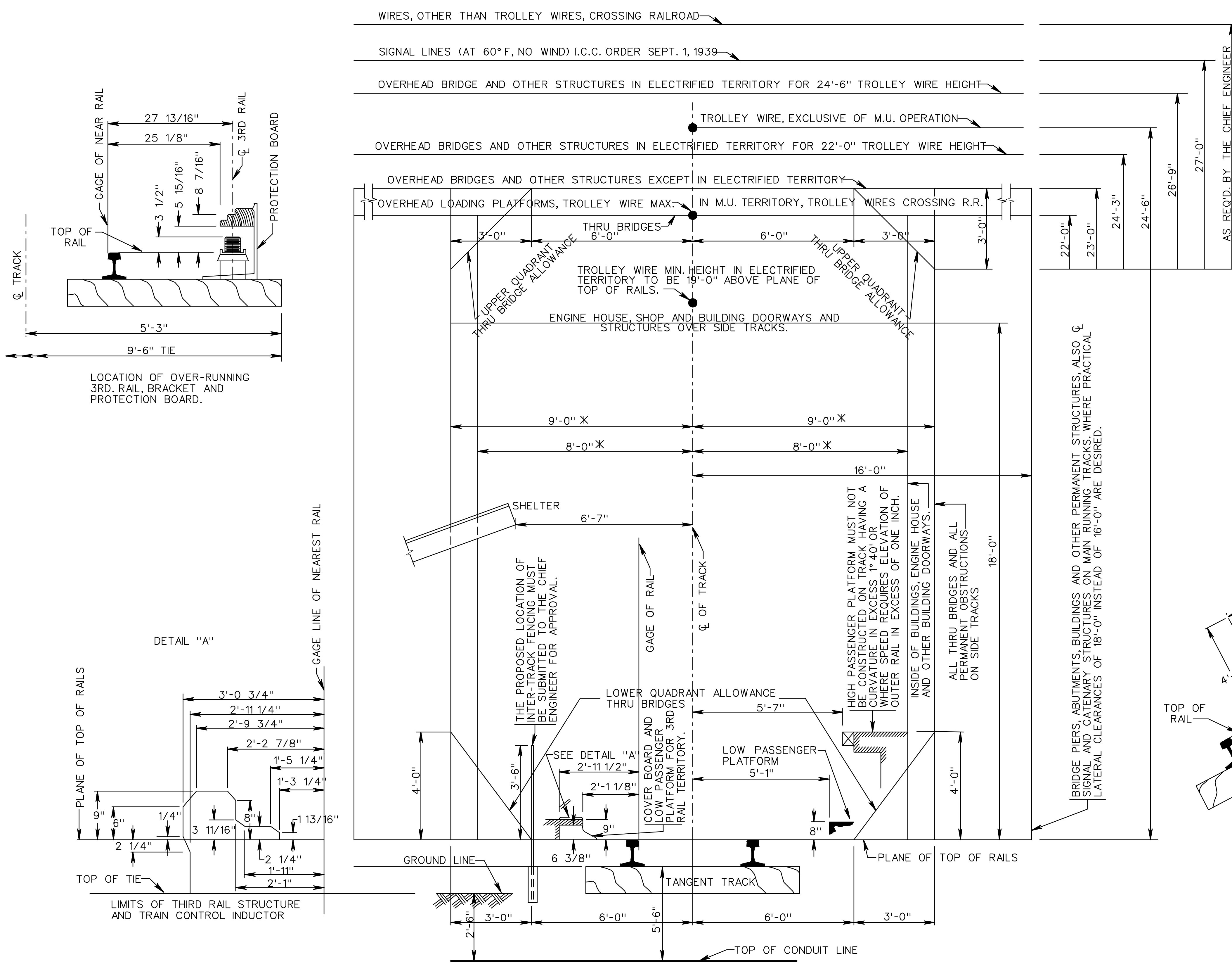
SHEET 14 OF 14

APPENDIX A.7.C

AMTRAK & LIRR CLEARANCE DIAGRAMS



NOTES:

CLEARANCE REQUIREMENTS SHOWN ON THIS PLAN APPLY ONLY TO NEW CONSTRUCTION OR RECONSTRUCTION. EXISTING STRUCTURES AND TRACKS MAY BE MAINTAINED AND EXTENDED AT PRESENT CLEARANCES. UNLESS OTHERWISE REQUIRED BY LOCAL OR STATE AUTHORITIES.

STRUCTURES MUST NOT BE LOCATED NEARER TO THE TRACK THAN THE MINIMUM CLEARANCE LIMITS SHOWN ON THIS PLAN AND THESE DISTANCES SHOULD BE EXCEEDED WHERE POSSIBLE. CONSIDERATION SHOULD BE GIVEN TO THE PROBABILITY OF INCREASED DISTANCE BETWEEN TRACK CENTER LINES. WIDENING ROADBED SHOULDERS AND WIDENING AND DEEPENING DITCHES, AND THE STRUCTURES SHOULD BE LOCATED ACCORDINGLY.

FOR STANDARD DISTANCES BETWEEN TRACK CENTER LINES AND THE SPACING OF TRACKS WHERE INTERTRACK CLEARANCE - LIMITING OBJECTS ARE LOCATED, SEE MW-1000 SPECIFICATIONS FOR INSPECTION, CONSTRUCTION AND MAINTENANCE OF TRACK

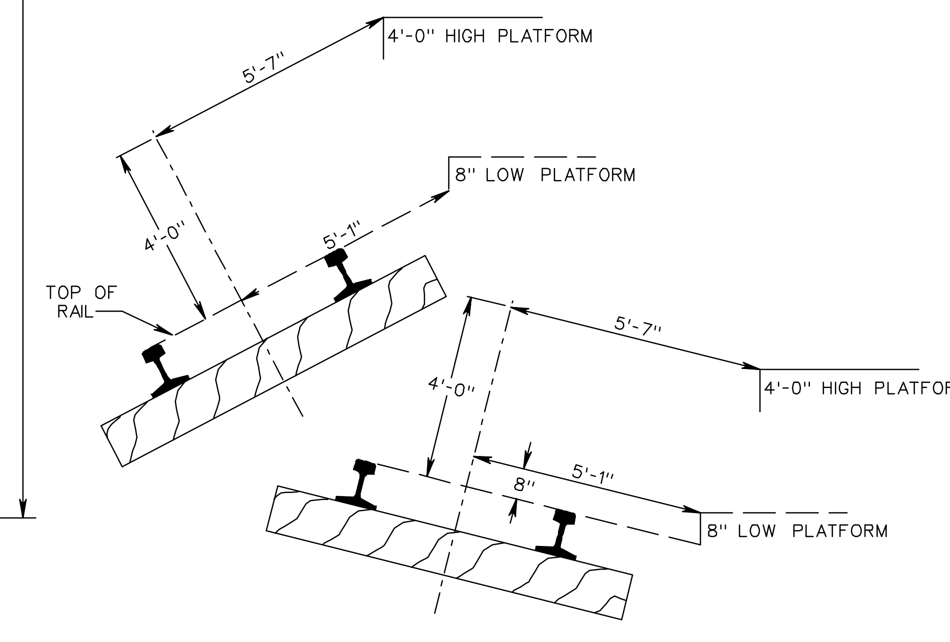
WHERE PHYSICAL CONDITIONS IMPOSE INSURMOUNTABLE RESTRICTIONS, NECESSITATING CLEARANCES CLOSER THAN THOSE SPECIFIED. THE MATTER MUST BE SUBMITTED TO THE CHIEF ENGINEER FOR ANY MODIFICATIONS, AND ALSO TO THE LOCAL OR STATE AUTHORITIES IF NECESSARY.

MINIMUM CLEARANCES SHOWN ON THIS PLAN ARE FOR TANGENT LEVEL TRACK.

FOR CURVED TRACK THE FOLLOWING PROVISIONS APPLY.

VERTICAL - MEASURED VERTICALLY ABOVE HIGH RAIL EXCEPT FOR PASSENGER AND FREIGHT PLATFORMS WHICH ARE MEASURED PERPENDICULAR TO THE PLANE OF TOP OF RAIL.

LATERAL - OUTSIDE AND INSIDE CLEARANCES SHALL BE MEASURED RADIALLY AND (EXCEPT FOR LOW PASSENGER PLATFORMS ON CURVES 13° OR LESS) HORIZONTALLY AND INCREASED BY 1 1/2 INCHES PER DEGREE OF CURVATURE OVER THAT SHOWN FOR TANGENT TRACK (EXCEPT LOW PASSENGER PLATFORMS ON CURVES 13° OR LESS). IN ADDITION, THE INSIDE CLEARANCE FOR SUPER ELEVATED TRACK SHALL BE FURTHER INCREASED BY 1 INCH FOR EACH 1 INCH OF SUPERELEVATION FOR EACH 5 FEET OF HEIGHT ABOVE TOP OF LOW RAIL.



VERTICAL MEASUREMENT ON CURVED TRACK

✱ FOR STATE CLEARANCE REQUIREMENTS, SEE A.R.E.M.A. MANUAL, CHAPTER 28, SECTION 3.6, LEGAL CLEARANCE REQUIREMENTS BY STATES.

Amtrak®

OFFICE OF THE
CHIEF ENGINEER OF TRACK

Phila., PA Date: April 20, 2000 Approved:

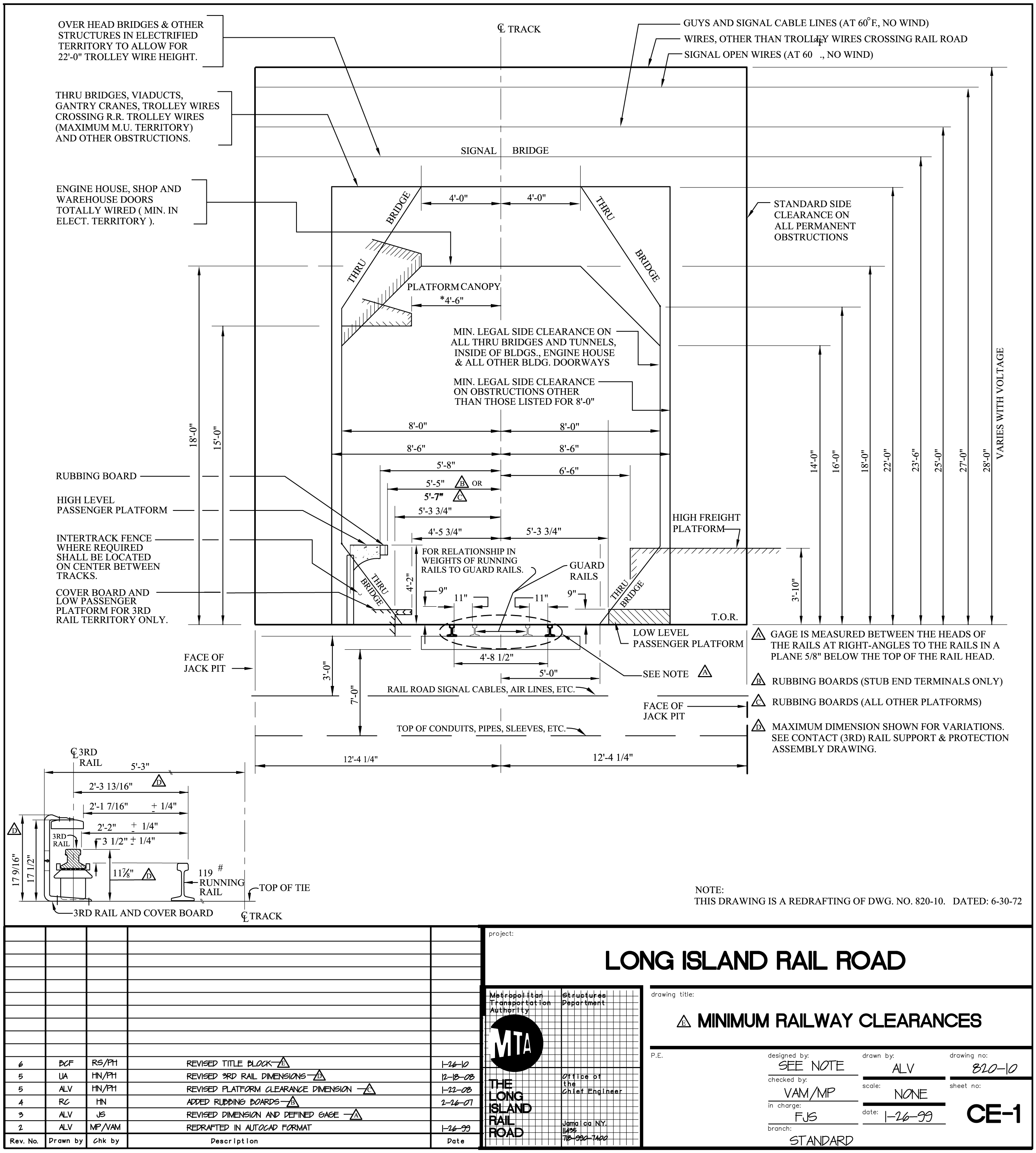
No.	Revisions	Date	By

STANDARD TRACK PLAN
MINIMUM ROADWAY CLEARANCES

Designed: Amtrak | Drawn: TDI-SLC | Checked: NJS | Date: 5-11-99

Dwg. No. AM70050G

Sheet No. 1 of 1



Long Island Rail Road
Minimum Railway Clearances Plan

NOTES:

THE MINIMUM CLEARANCE LIMITS PRESCRIBED BY THIS PLAN AND THESE DISTANCES SHOULD BE EXCEEDED WHERE POSSIBLE. STRUCTURES MUST NOT BE LOCATED NEARER TO TRACK THAN

MINIMUM CLEARANCES:

FOR TANGENT TRACK	SHALL BE SHOWN ON THIS PLAN.
FOR CURVED TRACK	ARE THE SAME AS SHOWN FOR TANGENT TRACK
ABOVE TOP OF RAIL	MEASURED VERTICALLY FROM TOP OF WHICH SHALL BE MEASURED FROM TOP OF NEAREST RAIL. OF HIGH RAIL. EXCEPT PASSENGER AND FREIGHT PLATFORMS. THE HEIGHT
SIDE CLEARANCE (MEASURED RADIALLY) — OUTSIDE:	ON THE OUTSIDE OF CURVED TRACK. SIDE CLEARANCES SHALL BE MEASURED HORIZONTALLY FROM THE GAGE OF NEAREST RAIL AND BE INCREASED BY 1 INCH PER DEGREE OF CURVATURE; OVER THAT SHOWN FOR TANGENT TRACK.
SIDE CLEARANCE (MEASURED RADIALLY) — INSIDE:	ON THE INSIDE OF CURVED TRACK SIDE CLEARANCES SHALL BE MEASURED HORIZONTALLY FROM THE GAGE OF NEAREST RAIL AND BE INCREASED BY 1 INCH PER DEGREE OF CURVATURE, OVER THAT SHOWN FOR TANGENT TRACK TO WHICH MUST ALSO BE ADDED TO THE AMOUNT OF SUPER ELEVATION OF THE HIGH RAIL ABOVE THE LOW RAIL.

CLEARANCE REQUIREMENTS SET FORTH ON THIS PLAN SHALL APPLY ONLY TO NEW CONSTRUCTION OR RECONSTRUCTION. STRUCTURES AND TRACKS CONSTRUCTED PRIOR TO APRIL 1, 1961. MAY BE MAINTAINED AND EXTENDED AT THE EXISTING CLEARANCE. OF THE RAIL ROAD LAW EFFECTIVE APRIL 1, 1961. THE FOLLOWING SIDE CLEARANCE ARE INCLUDED IN SECTION 51-A

MIN. C TO C DISTANCE FOR PARALLEL MAIN TRACKS	13'-6"	C TO C
MIN. C TO C DISTANCE YARD AND SIDE TRACKS	13'-6"	C TO C
ALL TRACKS PARALLEL TO MAIN OR PASSING TRACKS	15'-0"	C TO C
LADDER TRACKS TO ADJACENT TRACKS	18'-0"	C TO C
PARALLEL LADDER TRACKS	19'-0"	C TO C
PARALLEL TEAM TRACKS AND HOUSE TRACKS	13'-6"	C TO C

PLATFORM CANOPY CLEARANCE OF 4'-6" MAY BE USED ONLY IF RESTRICTIONS AGAINST RIDING ON THE SIDE OR TOP OF CARS AT THE LOCATION OF THE CANOPY ARE LISTED IN THE CURRENT TIME-TABLE UNDER SPECIAL INSTRUCTIONS.

Rev. No.	Drawn by	Chk by	Description	Date

project: LONG ISLAND RAIL ROAD

Metropolitan Transportation Authority — Structures Department

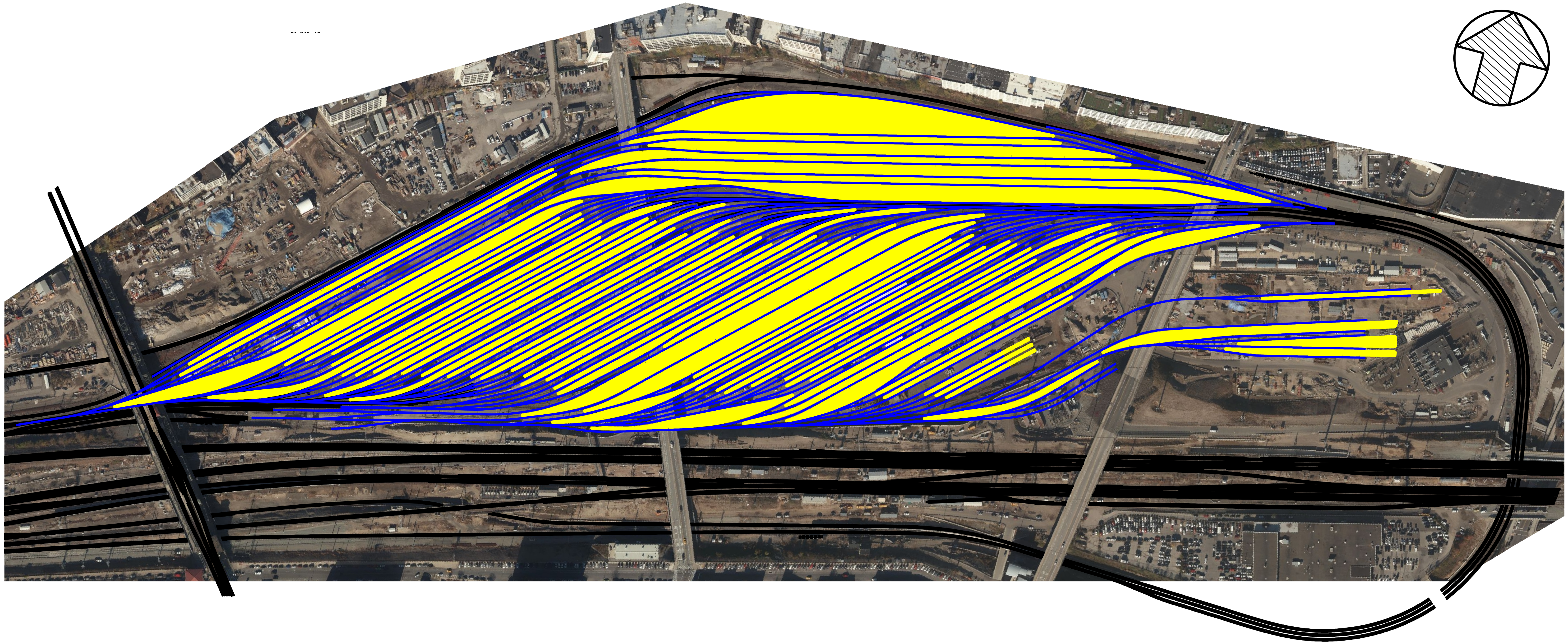
MTA

THE LONG ISLAND RAIL ROAD — Office of the Chief Engineer, Jamaica NY. 11435, 718-990-7400

drawing title: MINIMUM RAILWAY CLEARANCES

P.E.

designed by: SEE NOTE	drawn by: ALV	drawing no: 820-10
checked by: VAM/MP	scale: NONE	sheet no: CE-1
in charge: FJS	date: 1-26-99	
branch: STANDARD		



8'-6" MINIMUM TRACK CLEARANCE FOOTPRINT

LEGEND

EXISTING TRACK

PROPOSED TRACK - AMTRAK MASTER PLAN

8'-6" TRACK CLEARANCE FOOTPRINT

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: RD

DRAWN BY: OM

CHECKED BY: JMS

APPROVED BY: JMS

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SUNNYSIDE YARD MASTERPLAN
TRACK CLEARANCE FOOTPRINT

SCALE: NTS

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DATE 8/28/2019

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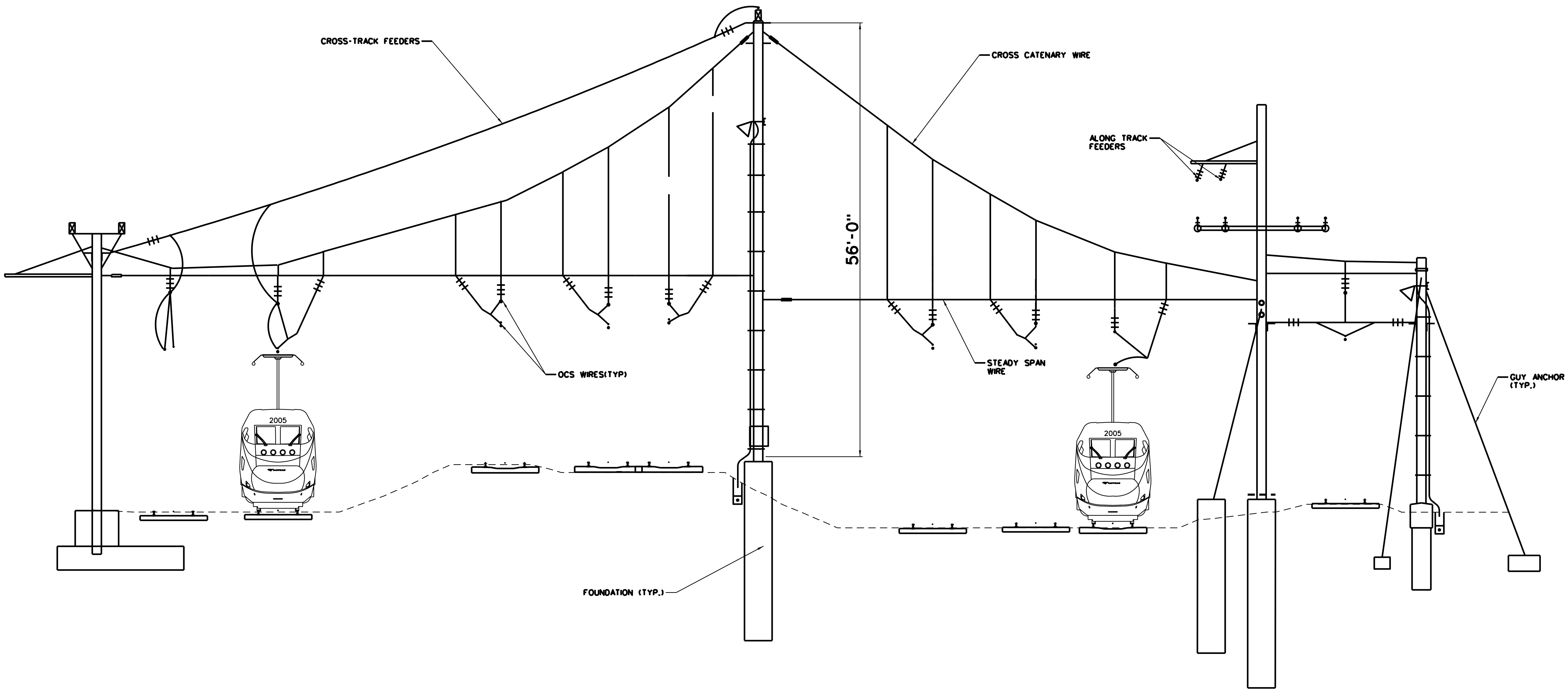
SHEET OF

APPENDIX A.7.D

EXISTING OCS STRUCTURES



TYPICAL CROSS-CATENARY STRUCTURE

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

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SUNNYSIDE YARD MASTERPLAN
TYPICAL CROSS CATENARY STRUCTURE

SCALE: NTS
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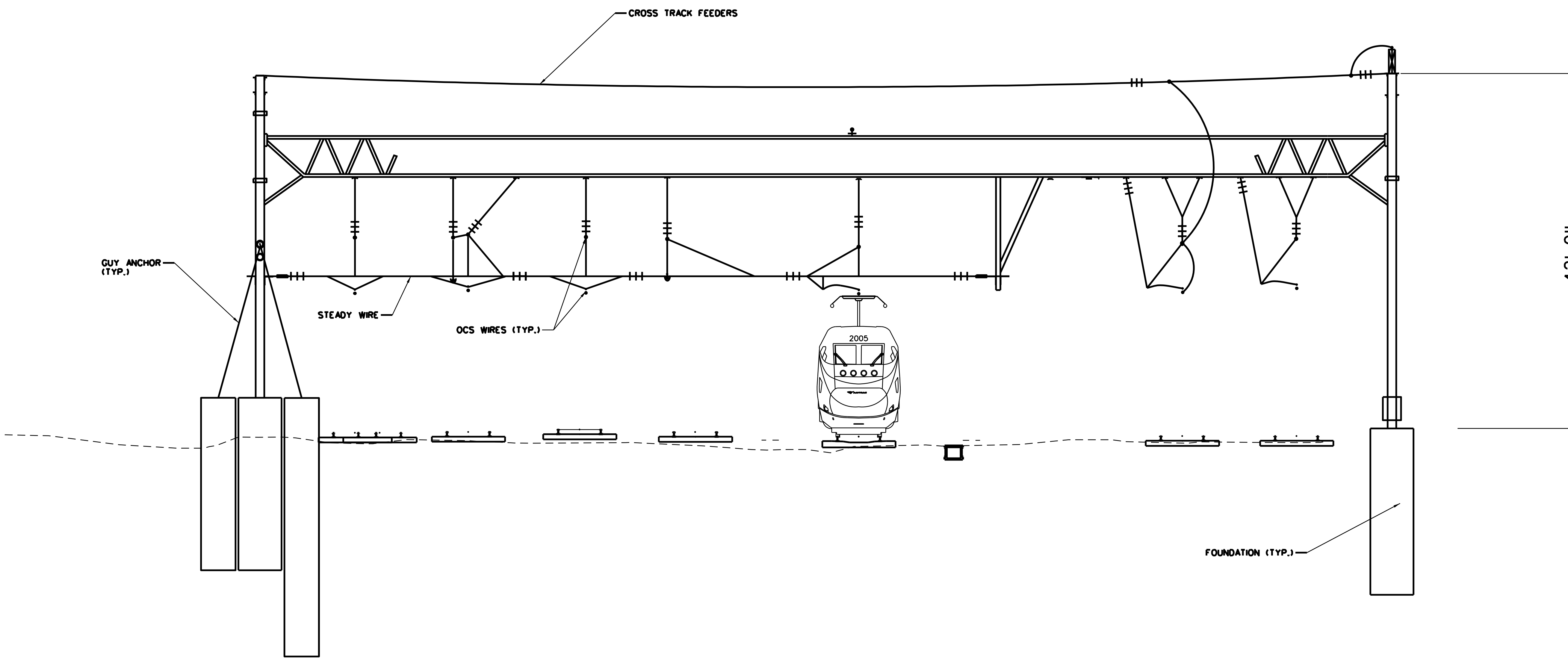
DATE JUL. 29, 2019
DRAWING NO.
SHEET 2 OF 7



TYPICAL TRUSS STRUCTURE

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

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APPROVED BY:

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TYPICAL CROSS CATENARY STRUCTURE

SCALE: NTS
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DATE JUL. 29, 2019
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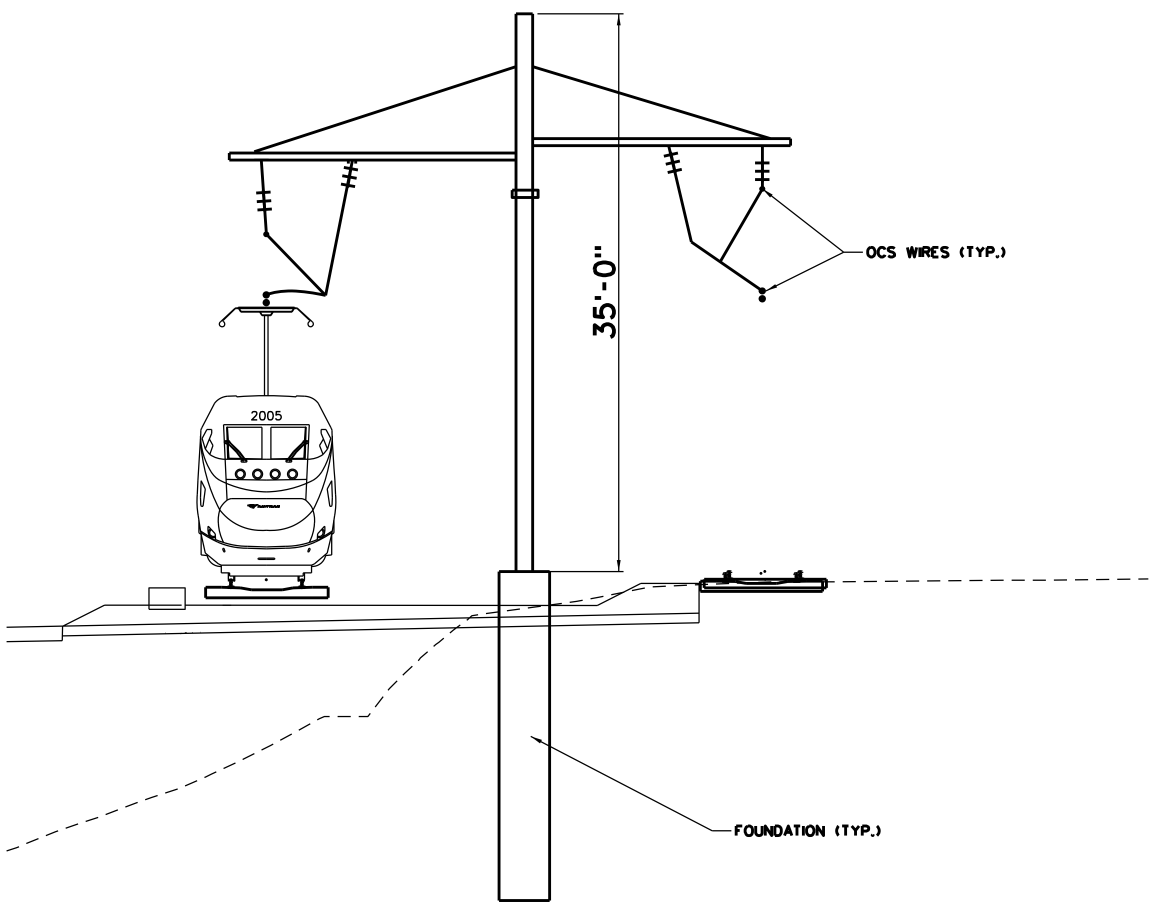
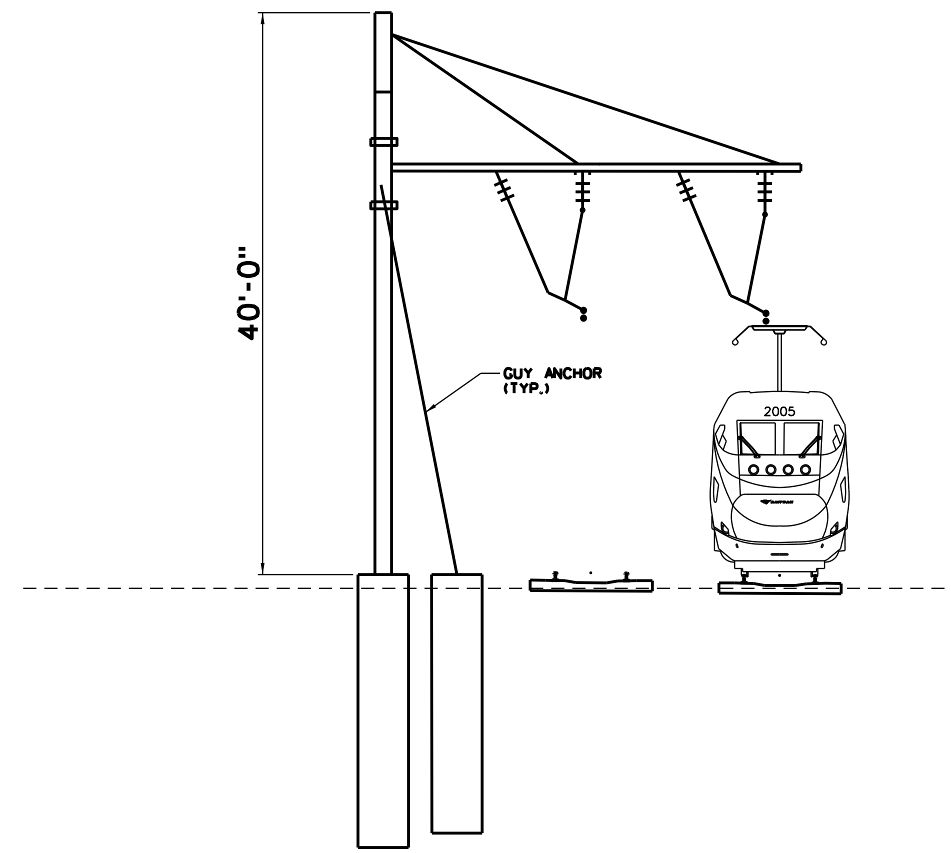
SHEET 3 OF 7



TYPICAL DOUBLE CANTILEVER STRUCTURE



TYPICAL SINGLE CANTILEVER STRUCTURE

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

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SUNNYSIDE YARD MASTERPLAN
TYPICAL CROSS CANTILEVER STRUCTURE

SCALE: NTS
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DATE JUL. 29, 2019
DRAWING NO.
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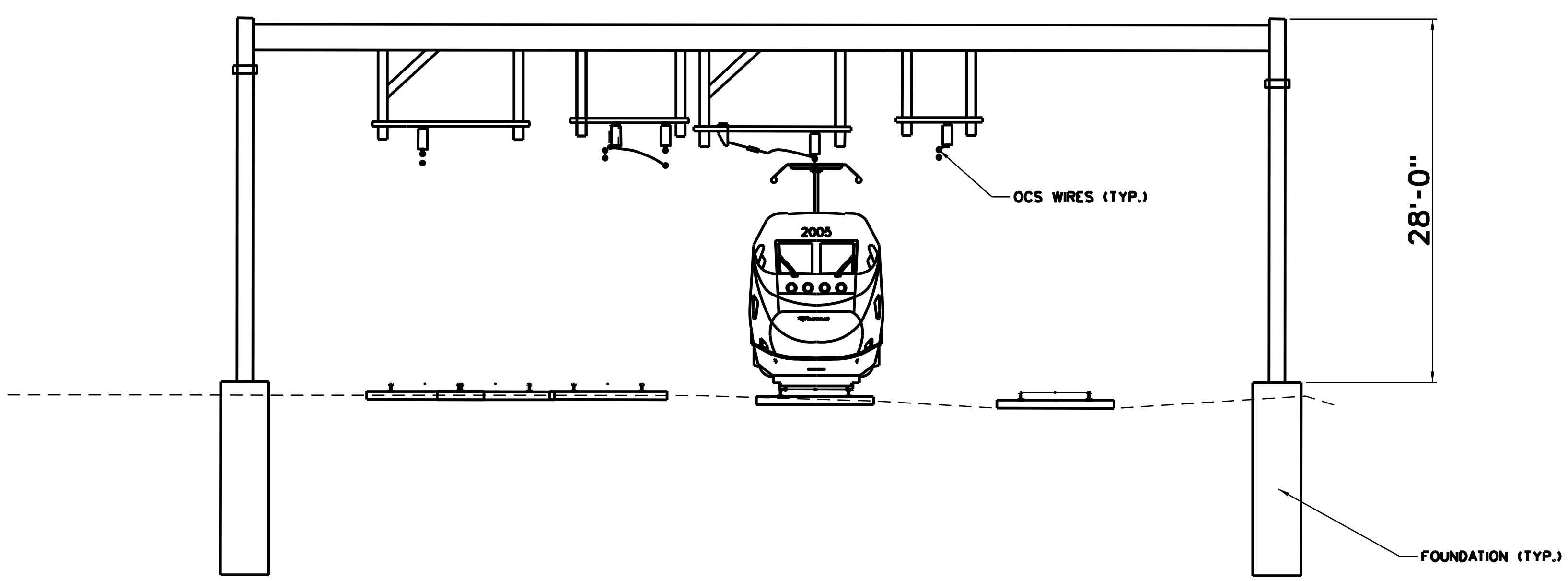
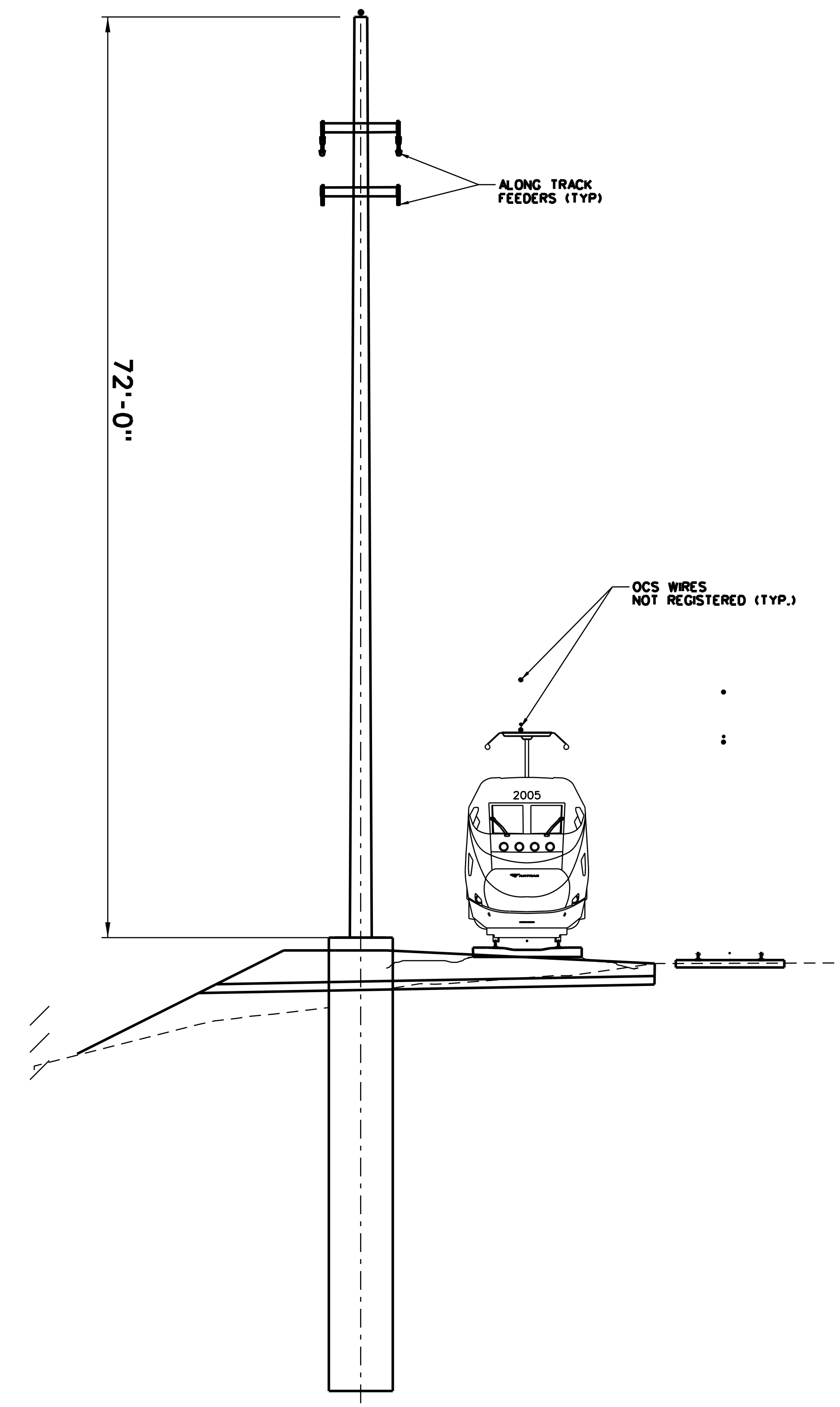


TYPICAL BEAM STRUCTURE



TYPICAL FEEDER TOWER

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

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SUNNYSIDE YARD MASTERPLAN
TYPICAL BEAM AND FEEDER TOWER STRUCTURES

SCALE: NTS
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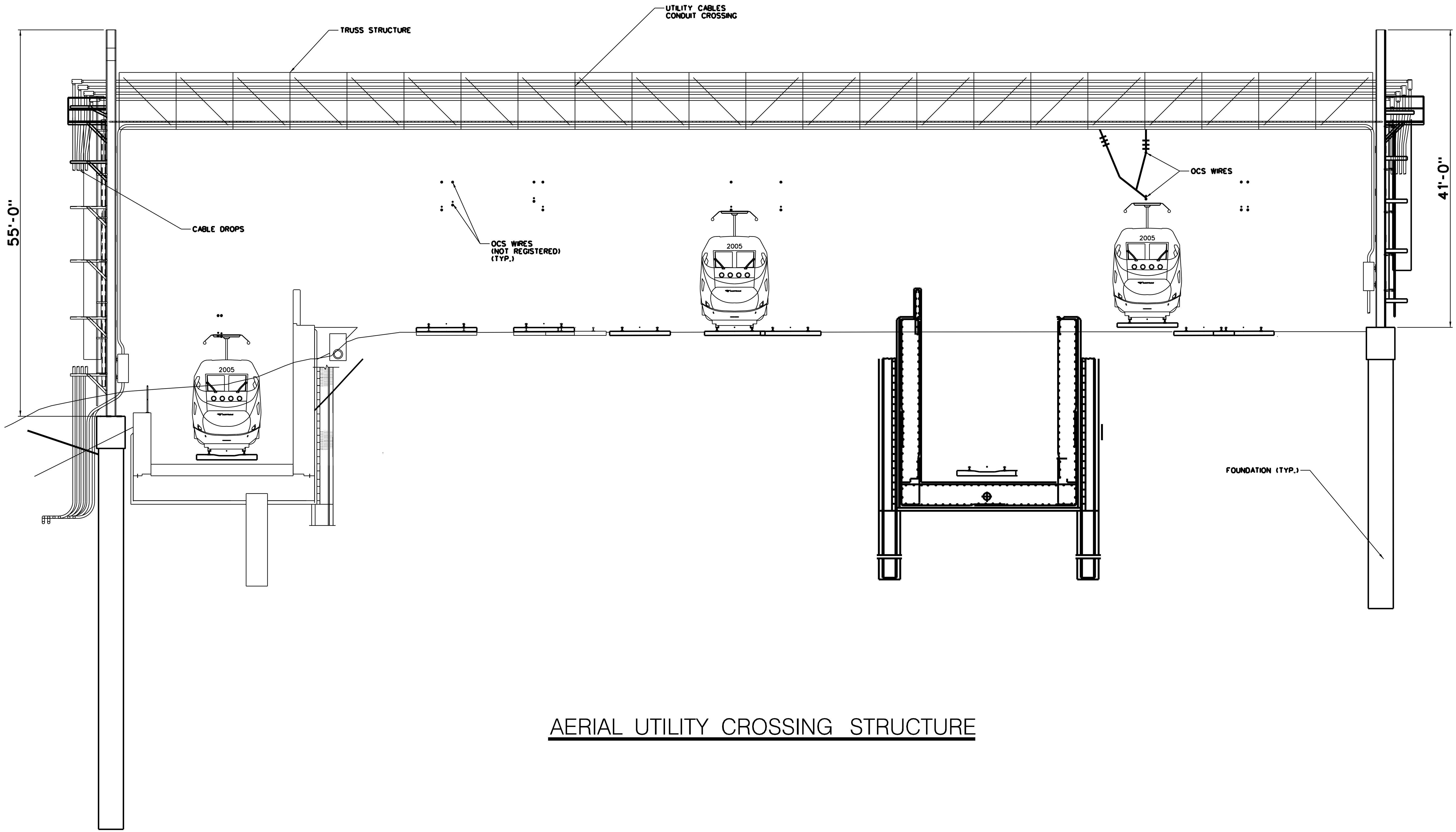

AERIAL UTILITY CROSSING STRUCTURE

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SUNNYSIDE YARD MASTERPLAN
AERIAL UTILITY CROSSING

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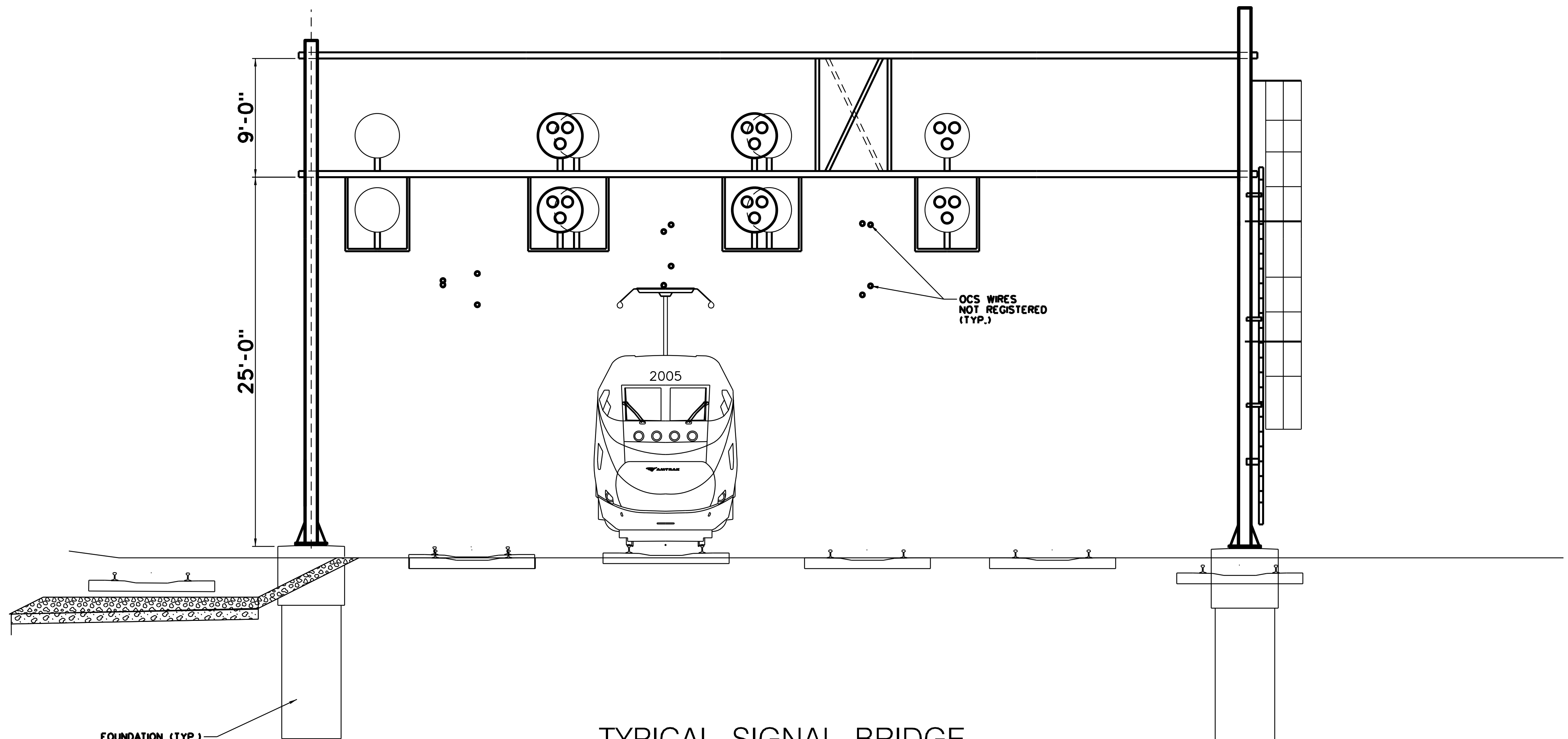

TYPICAL SIGNAL BRIDGE

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TYPICAL SIGNAL BRIDGE

SCALE: NTS
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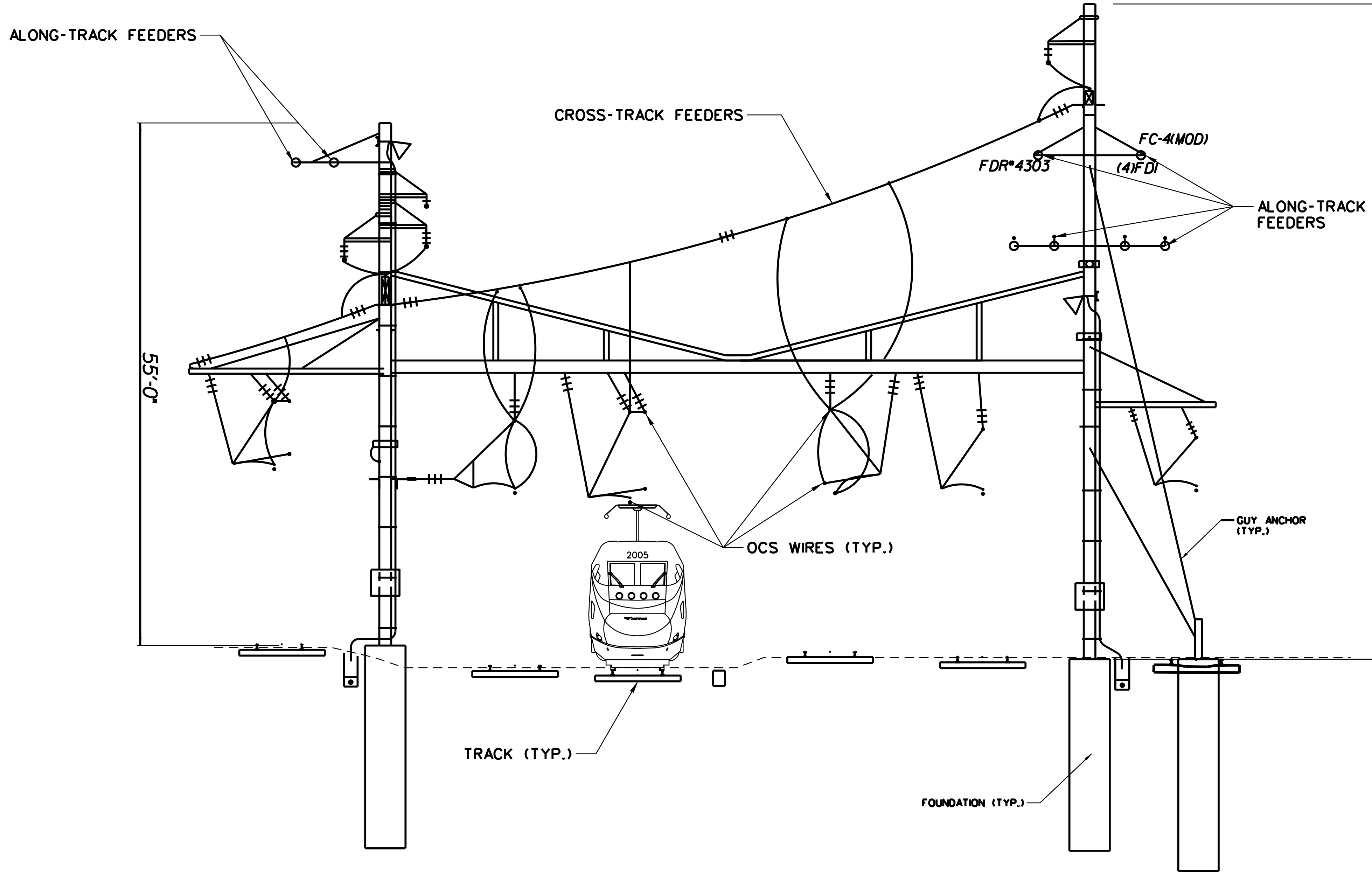

TYPICAL K–FRAME STRUCTURE

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350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

IT IS A VIOLATION OF SECTION 7209.2 OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER IN ANY WAY PLANS, SPECIFICATIONS, PLATS OR REPORTS TO WHICH THE SEAL OF A PROFESSIONAL ENGINEER HAS BEEN APPLIED. IF AN ITEM BEARING THE SEAL OF A PROFESSIONAL ENGINEER IS ALTERED THE ALTERING ENGINEER SHALL AFFIX TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE, THE DATE, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

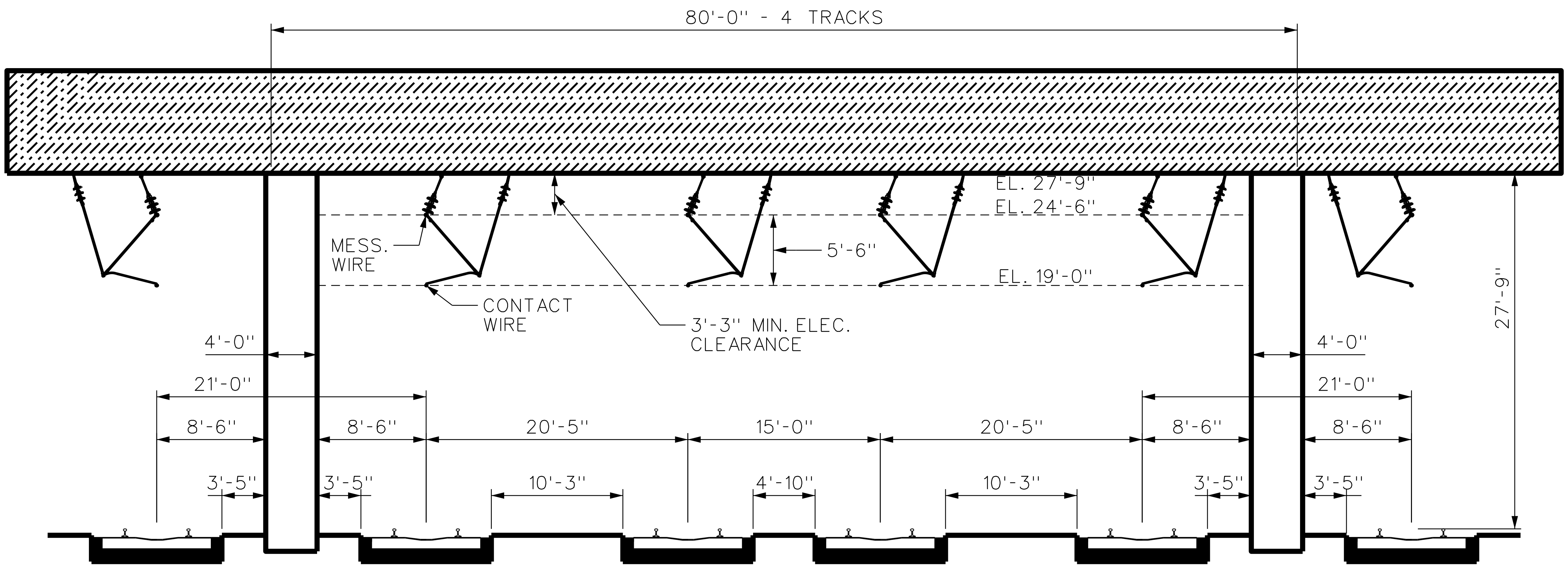
NYCEDC
SUNNYSIDE YARD MASTERPLAN
TYPICAL K–FRAME STRUCTURE

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE JUL. 29, 2019
DRAWING NO.
SHEET 1 OF 7

APPENDIX A.7.E

PROPOSED AMTRAK OCS CLEARANCES



NOTES:

1. For Minimum Roadway Clearances refer to AMTRAK ET-200 Drawing.
2. For electrical clearances shown for cross track feeders, the Gibbs & Hill Principals of Design was used.
3. SAP assemblies are shown, but other Amtrak approved assemblies may be used.

STANDARD AMTRAK OCS CLEARANCES WITHOUT ALONG AND CROSS TRACK FEEDERS

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

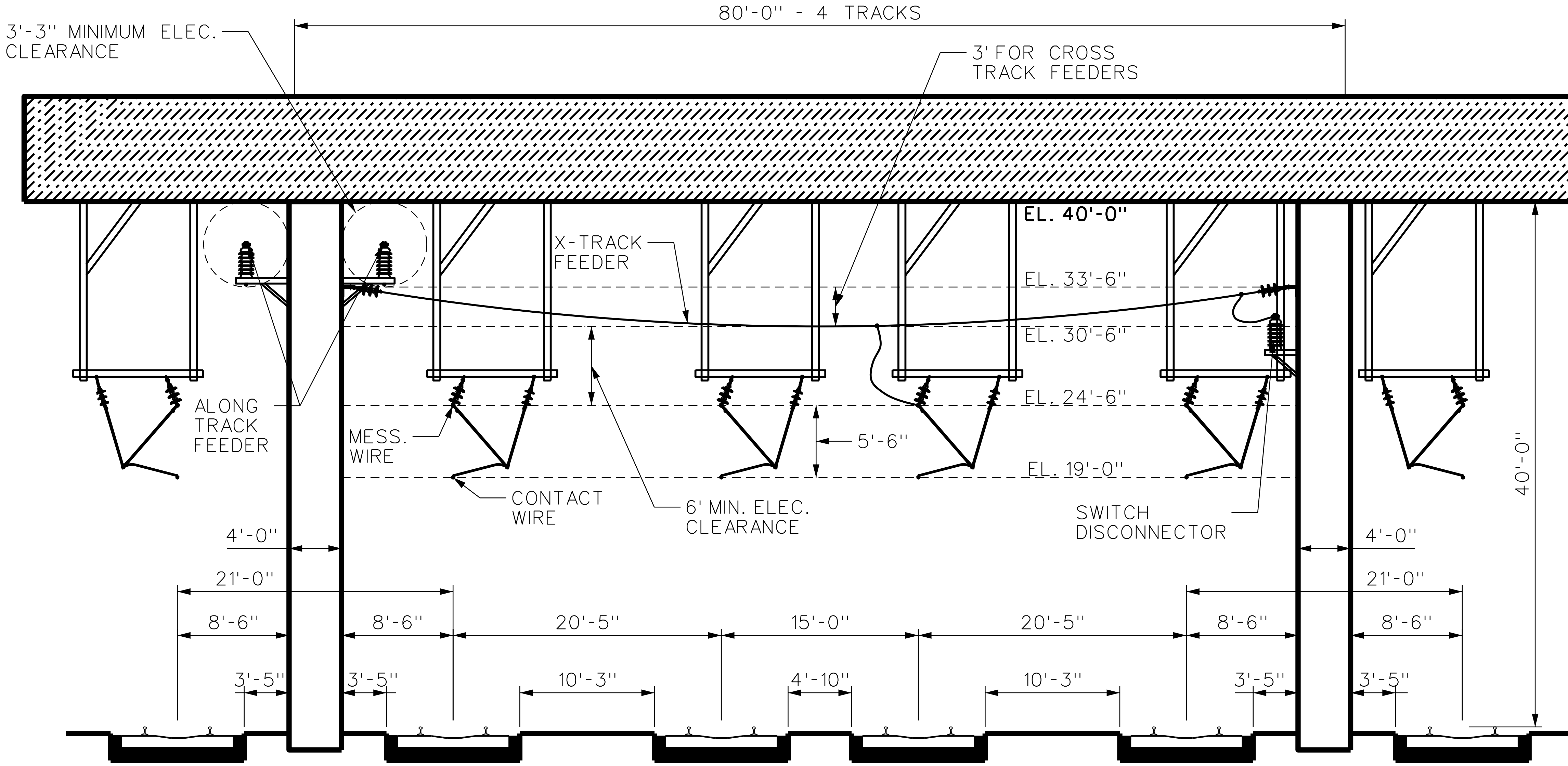
DESIGNED BY: XXXX
DRAWN BY: XXXX
CHECKED BY:
APPROVED BY:

HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

NYCEDC
SUNNYSIDE YARD MASTERPLAN
OCS CLEARANCE

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE JUL. 30, 2019
DRAWING NO.
SHEET 1 OF 8



NOTES:

1. For Minimum Roadway Clearances refer to AMTRAK ET-200 Drawing.
2. For electrical clearances shown for cross track feeders, the Gibbs & Hill Principals of Design was used.
3. SAP assemblies are shown, but other Amtrak approved assemblies may be used.

STANDARD AMTRAK OCS CLEARANCES WITH ALONG AND CROSS TRACK FEEDERS

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

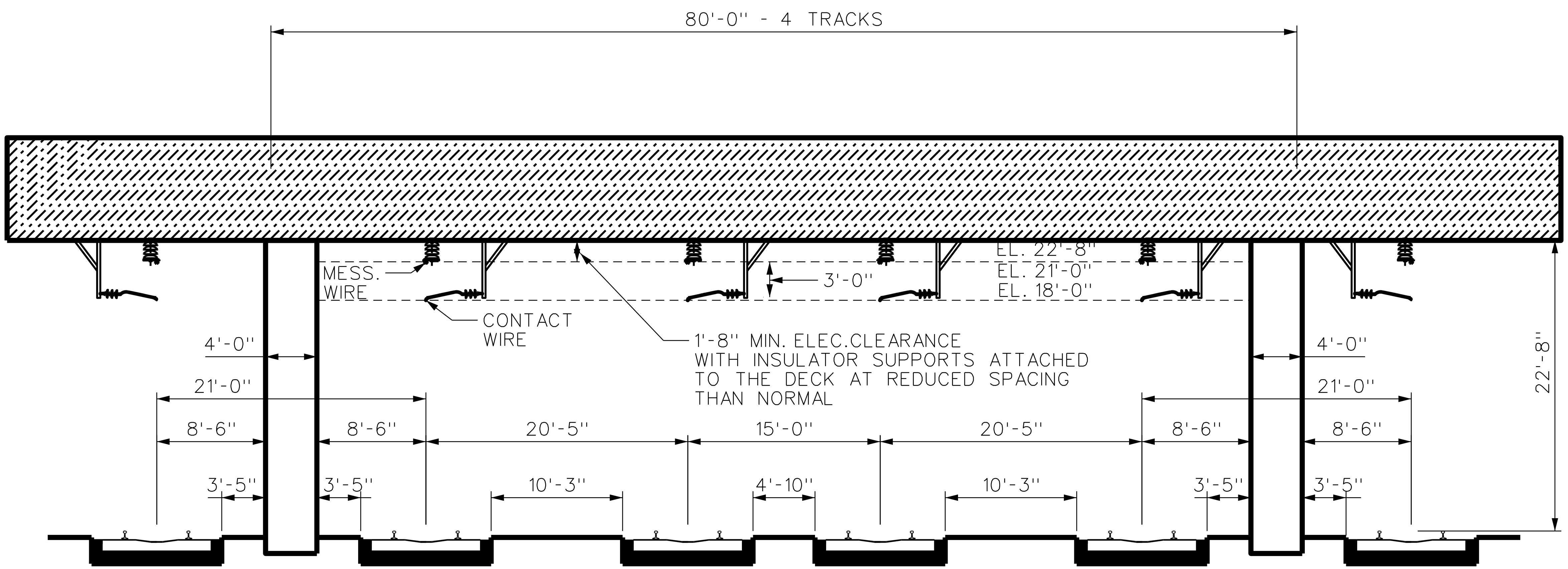
DESIGNED BY: XXXX
DRAWN BY: XXXX
CHECKED BY:
APPROVED BY:

HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

NYCEDC
SUNNYSIDE YARD MASTERPLAN
OCS CLEARANCE

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE JUL. 30, 2019
DRAWING NO.
SHEET 2 OF 8



NOTES:

1. For Minimum Roadway Clearances refer to AMTRAK ET-200 Drawing.
2. For electrical clearances shown for cross track feeders, the Gibbs & Hill Principals of Design was used.
3. SAP assemblies are shown, but other Amtrak approved assemblies may be used.

REDUCED AMTRAK OCS CLEARANCES WITHOUT ALONG AND CROSS TRACK FEEDERS

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

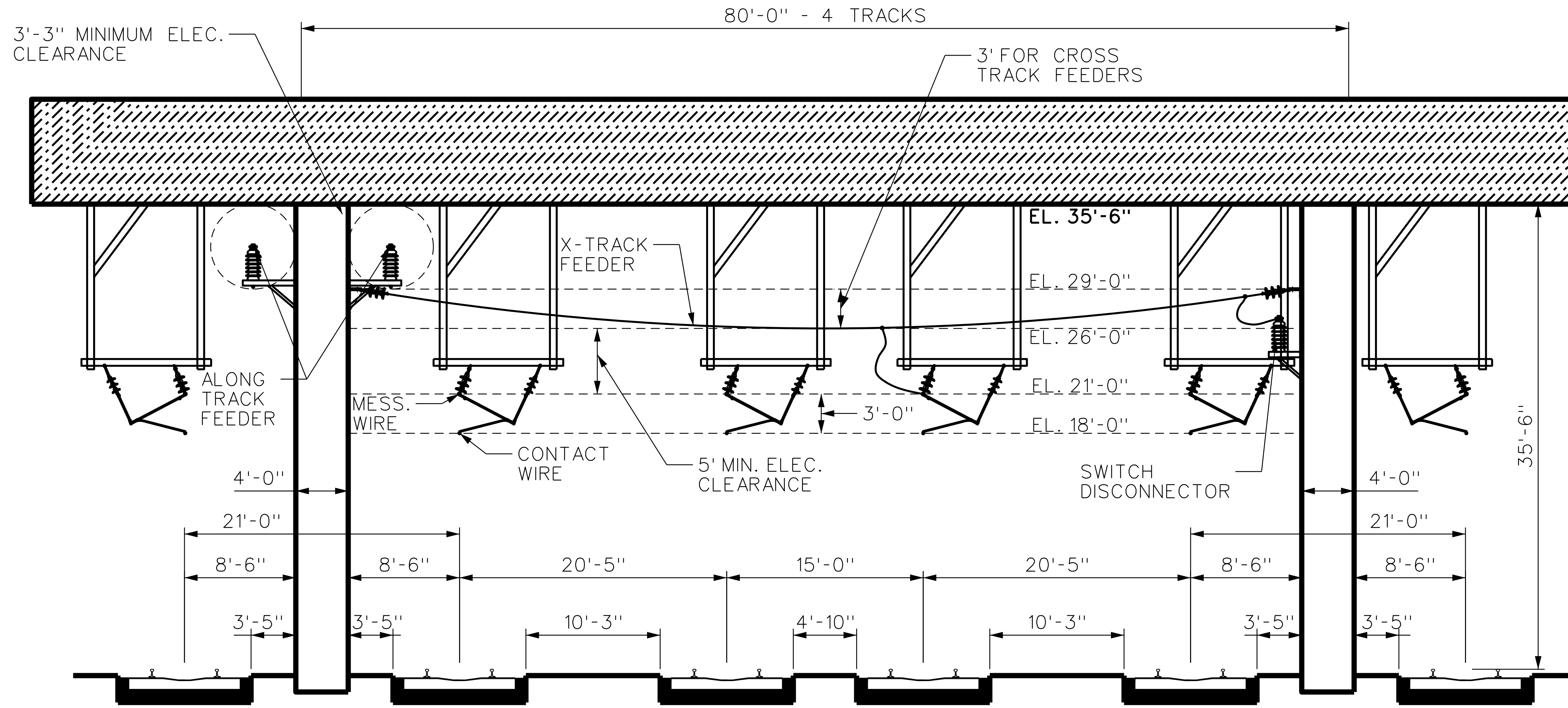
DESIGNED BY: XXXX
DRAWN BY: XXXX
CHECKED BY:
APPROVED BY:

HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

NYCEDC
SUNNYSIDE YARD MASTERPLAN
OCS CLEARANCE

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE JUL. 30, 2019
DRAWING NO.
SHEET 3 OF 8



NOTES:

1. For Minimum Roadway Clearances refer to AMTRAK ET-200 Drawing.
2. For electrical clearances shown for cross track feeders, the Gibbs & Hill Principals of Design was used.
3. SAP assemblies are shown, but other Amtrak approved assemblies may be used.

REDUCED AMTRAK OCS CLEARANCES WITH ALONG AND CROSS TRACK FEEDERS

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: XXXX
DRAWN BY: XXXX
CHECKED BY:
APPROVED BY:

HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

IT IS A VIOLATION OF SECTION 7209.2 OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER IN ANY WAY PLANS, SPECIFICATIONS, PLATS OR REPORTS TO WHICH THE SEAL OF A PROFESSIONAL ENGINEER HAS BEEN APPLIED. IF AN ITEM BEARING THE SEAL OF A PROFESSIONAL ENGINEER IS ALTERED THE ALTERING ENGINEER SHALL AFFIX TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE, THE DATE, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

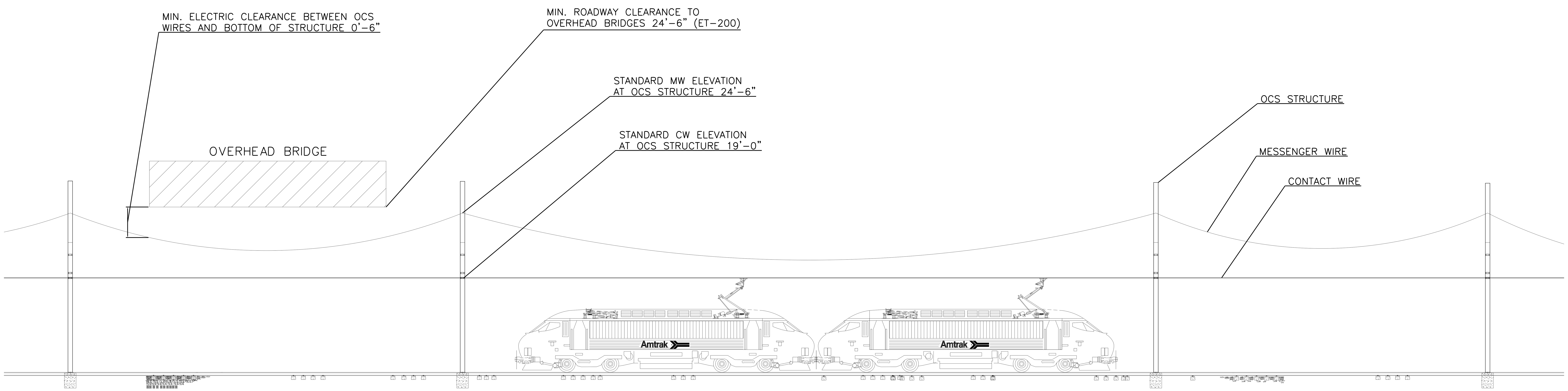
NYCEDC
SUNNYSIDE YARD MASTERPLAN
OCS CLEARANCE

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE JUL. 30, 2019
DRAWING NO.
SHEET 4 OF 8

STANDARD OCS PROFILE AND CLEARANCES

OCS WIRES RUNNING UNDER OVERHEAD BRIDGE



NOTES

1. CROSS TRACK AND ALONG TRACK FEEDERS NOT CONSIDERED.

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: JMS
DRAWN BY: JMS
CHECKED BY:
APPROVED BY:

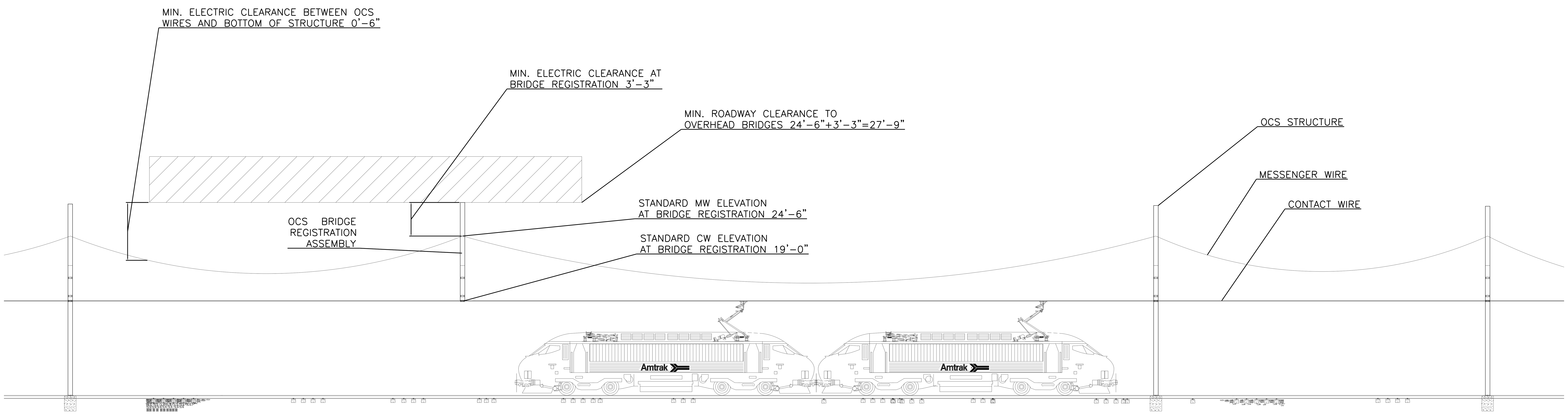
HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

NYCEDC
SUNNYSIDE YARD MASTERPLAN
OVERHEAD CLEARANCE SCHEMATICS

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE FEB. 14, 2019
DRAWING NO.
SHEET 5 OF 8

STANDARD OCS PROFILE AND CLEARANCES
OCS WIRES SUPPORTED UNDER OVERHEAD BRIDGE



NOTES

1. CROSS TRACK AND ALONG TRACK FEEDERS NOT CONSIDERED.

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: JMS
DRAWN BY: JMS
CHECKED BY:
APPROVED BY:

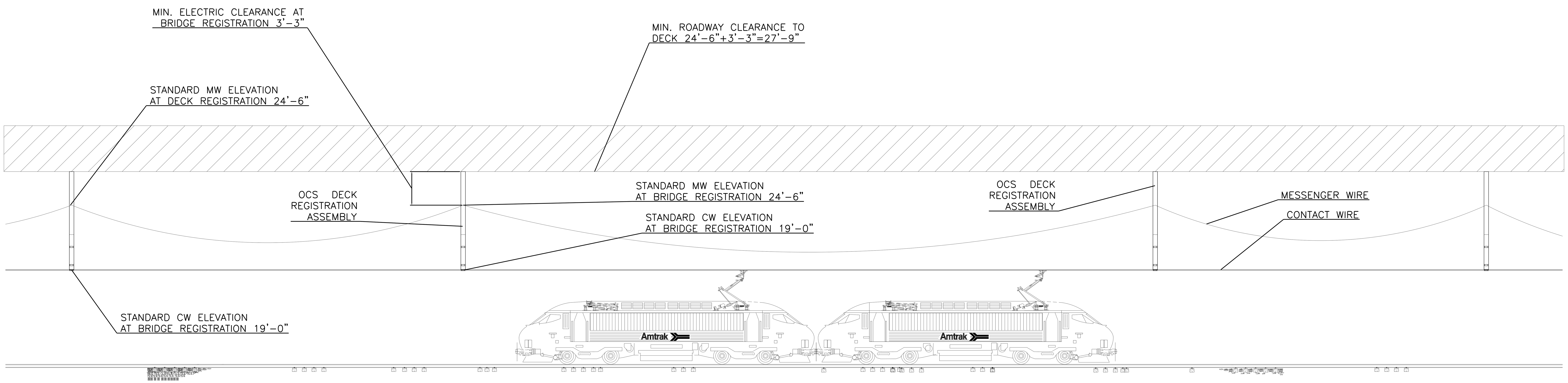
HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

NYCEDC
SUNNYSIDE YARD MASTERPLAN
OVERHEAD CLEARANCE SCHEMATICS

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE FEB. 14, 2019
DRAWING NO.

STANDARD OCS PROFILE AND CLEARANCES
OCS WIRES SUPPORTED UNDER DECK



NOTES
1. CROSS TRACK AND ALONG TRACK FEEDERS NOT CONSIDERED.

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: JMS
DRAWN BY: JMS
CHECKED BY:
APPROVED BY:

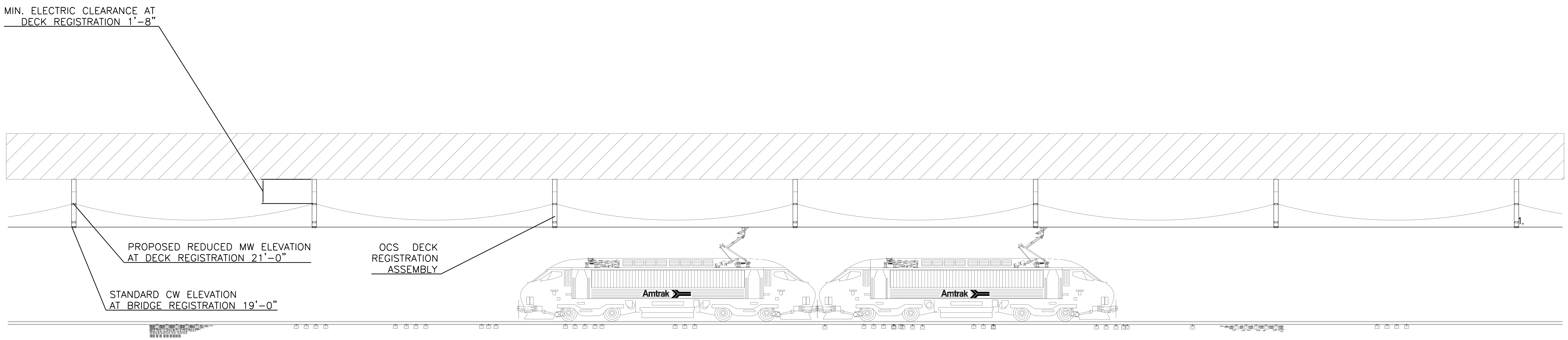
HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

NYCEDC
SUNNYSIDE YARD MASTERPLAN
OVERHEAD CLEARANCE SCHEMATICS

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE FEB. 14, 2019
DRAWING NO.

PROPOSED REDUCED OCS PROFILE AND CLEARANCES
OCS WIRES SUPPORTED UNDER DECK



NOTES
1. CROSS TRACK AND ALONG TRACK FEEDERS NOT CONSIDERED.

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: JMS
DRAWN BY: JMS
CHECKED BY:
APPROVED BY:

HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

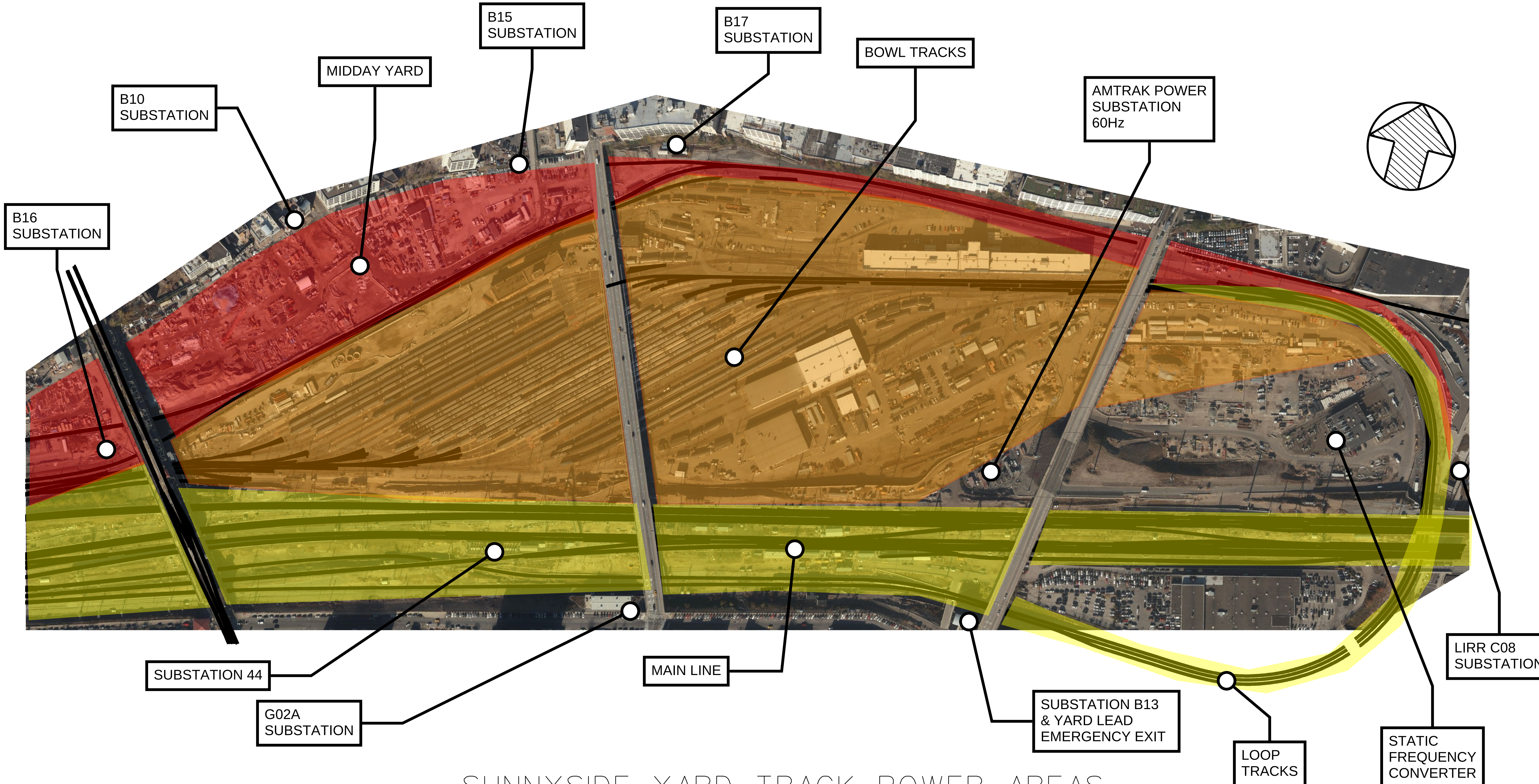
NYCEDC
SUNNYSIDE YARD MASTERPLAN
OVERHEAD CLEARANCE SCHEMATICS

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE FEB. 14, 2019
DRAWING NO.

APPENDIX A.7.E

TRACK POWER AREAS



SUNNYSIDE YARD TRACK POWER AREAS

LEGEND

- (yellow) TRACKS WITH AC CATENARY AND THIRD RAIL
- (orange) TRACKS WITH AC CATENARY
- (red) TRACKS WITH THIRD RAIL

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: JMS
DRAWN BY: OM
CHECKED BY: JMS
APPROVED BY: JMS

HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

NYCEDC
SUNNYSIDE YARD MASTERPLAN
TRACK POWER AREAS

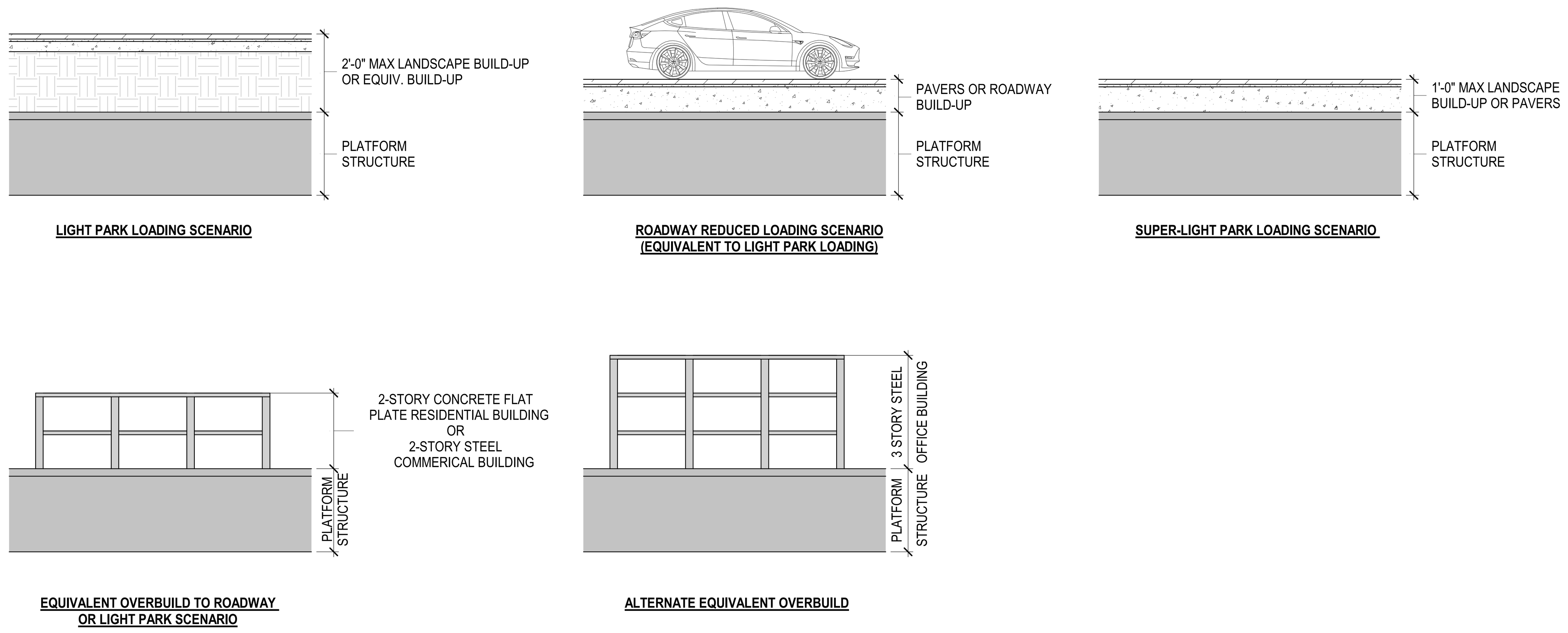
SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE 8/28/2019
DRAWING NO.
SHEET OF

APPENDIX A.7.G

STRUCTURAL DRAWING SET

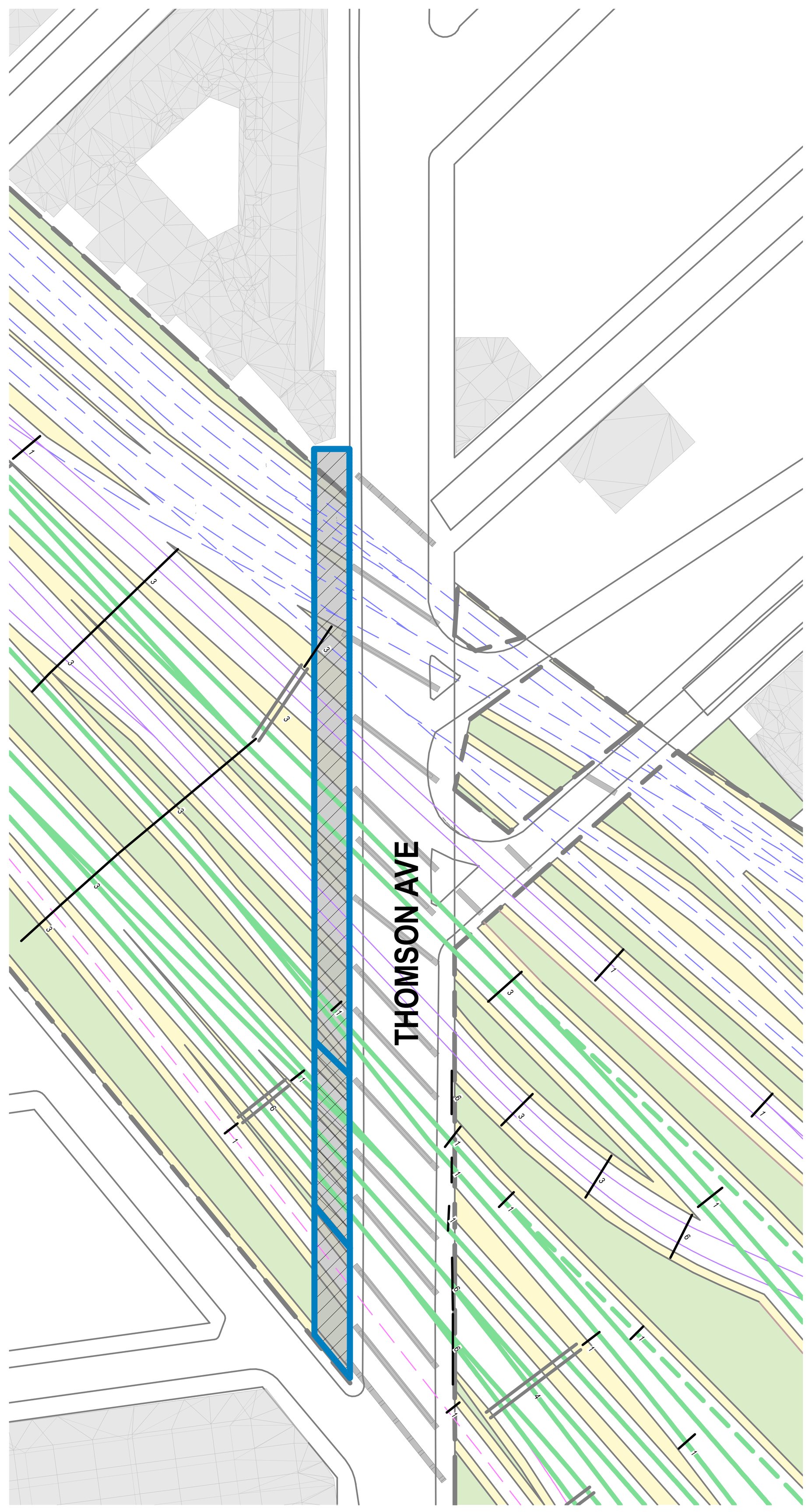
NYCEDC



NOTES:
1. LOADING SCENARIOS INCLUDE AN ALLOWANCE OF 30 PSF FOR UTILITIES TO BE HUNG FROM BELOW DECK AND 30 PSF ALLOWANCES FOR UTILIES ABOVE DECK

1 PRIMER PHASE LOADING SCENARIO

SCALE: 3/16" = 1'-0"



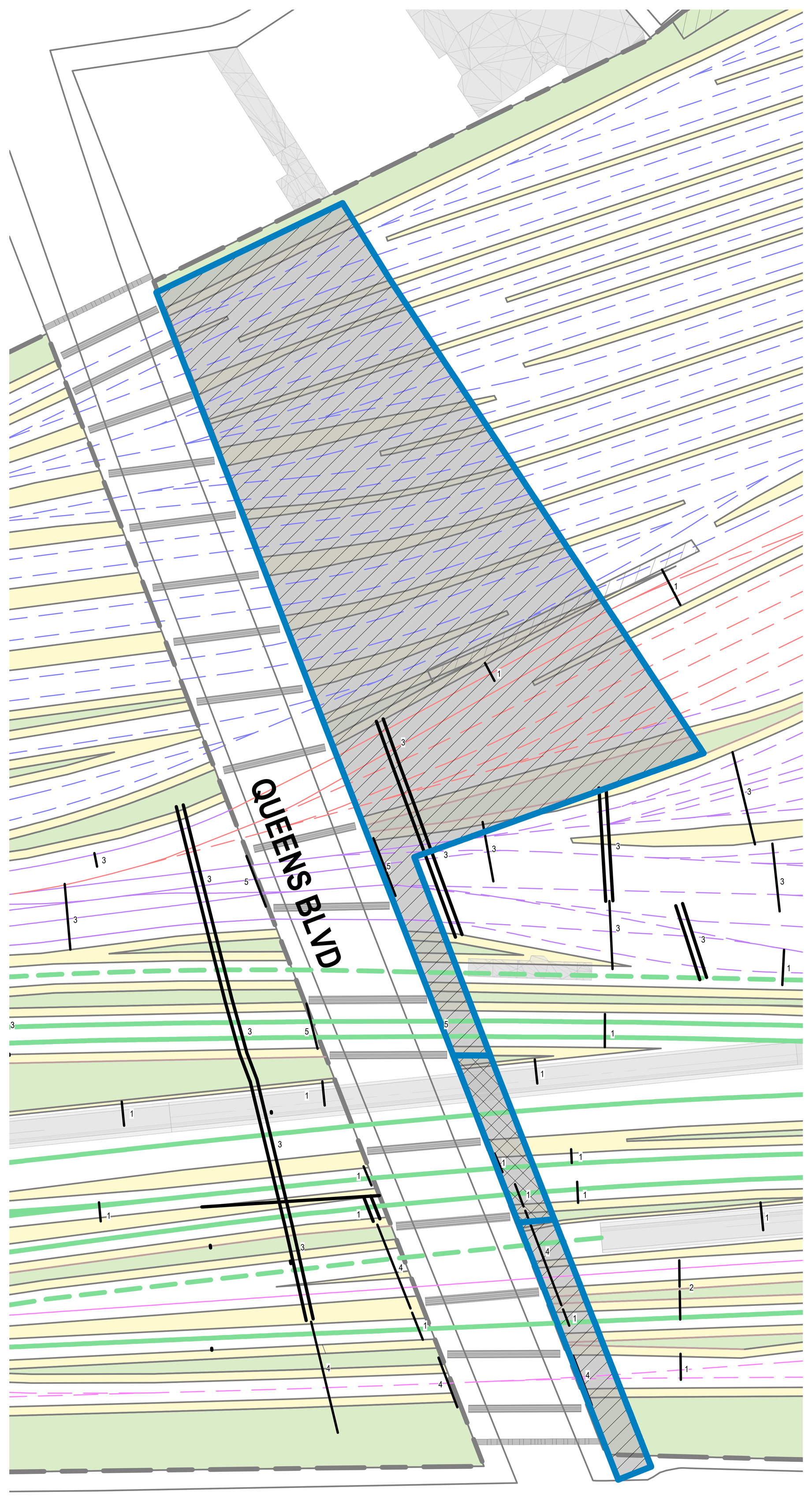
LOADING LEGEND

LIGHT PARK
SUPERIMPOSED LOAD = 100 PSF
LIVE LOAD = 300 PSF

DECKING OVER MAINLINE
SUPER LIGHT PARK
SUPERIMPOSED LOAD = 200 PSF
LIVE LOAD = 100 PSF

2 THOMSON AVE - LOADING DIAGRAM

SCALE: 1" = 80'-0"



LOADING LEGEND

LIGHT PARK
SUPERIMPOSED LOAD = 100 PSF
LIVE LOAD = 300 PSF

DECKING OVER MAINLINE
SUPER LIGHT PARK
SUPERIMPOSED LOAD = 200 PSF
LIVE LOAD = 100 PSF

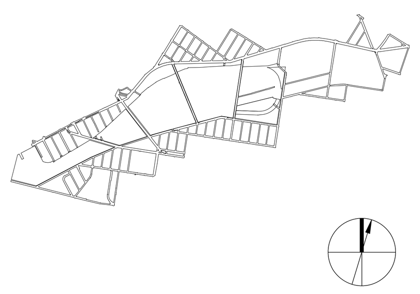
3 QUEENS BLVD - LOADING DIAGRAM

SCALE: 1" = 80'-0"

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:
STRUCTURE

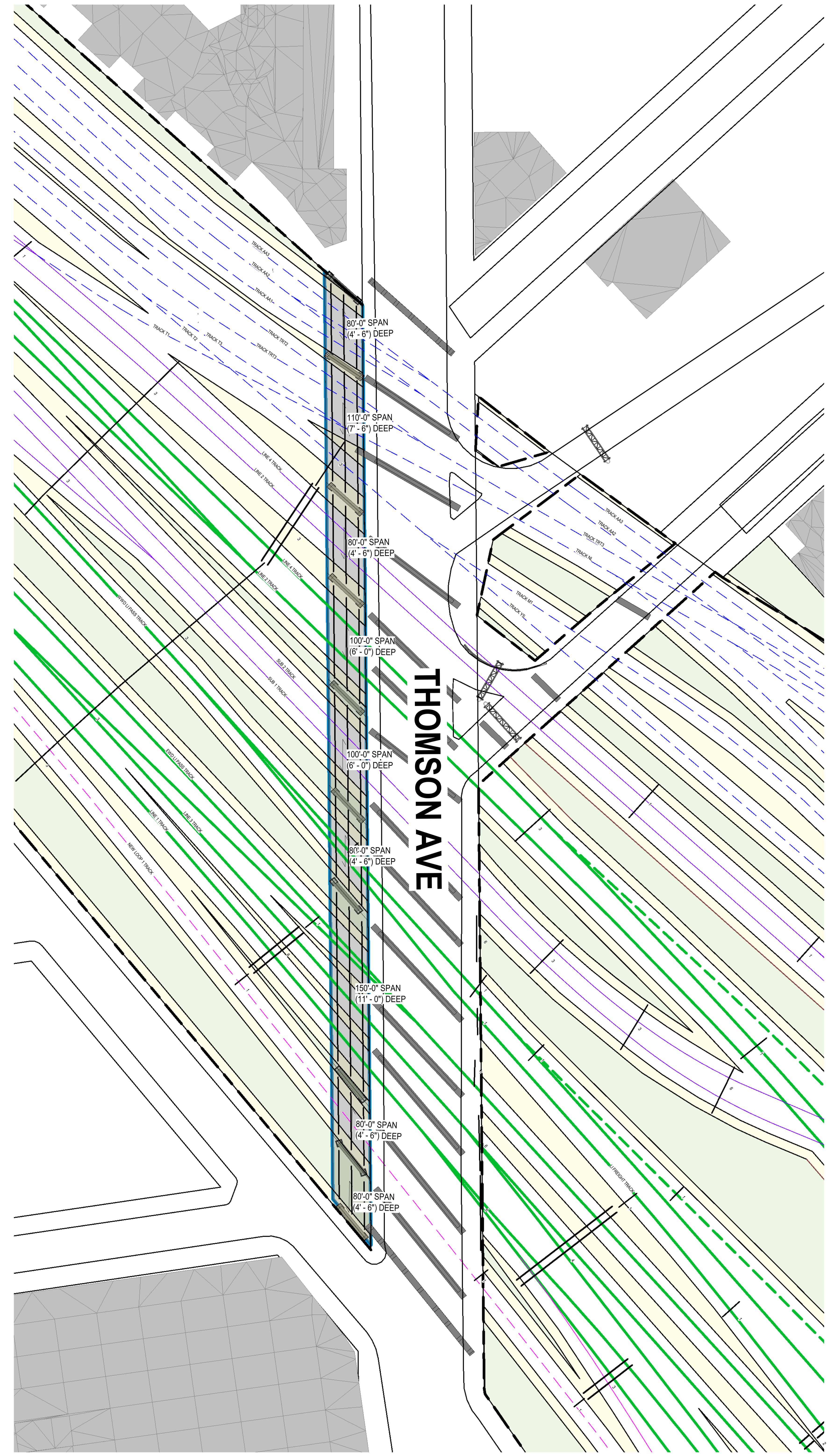
Title
PRIMER PHASE LOADING ASSUMPTIONS

Thornton Tomasetti

Designed by	CCG
Drawn by	AP
Checked by	JB
Date	03/20/19
Drawing Number	S-021.00

1 **THOMSON AVE BRIDGE - FOUNDATION PLAN - PRIMER PHASE**

SCALE: 1" = 40'-0"



2 **THOMSON AVE BRIDGE - FRAMING PLAN - PRIMER PHASE**

SCALE: 1" = 40'-0"

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE; 3' CLEARANCE CUT AND COVER TUNNELS; 10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE

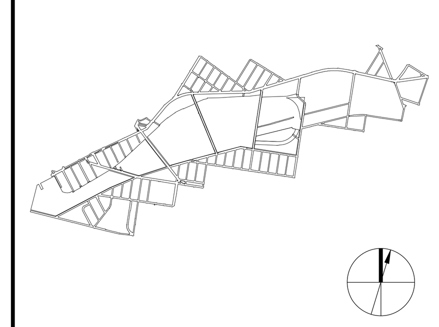
- PRIMER PHASE BOUNDARY

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

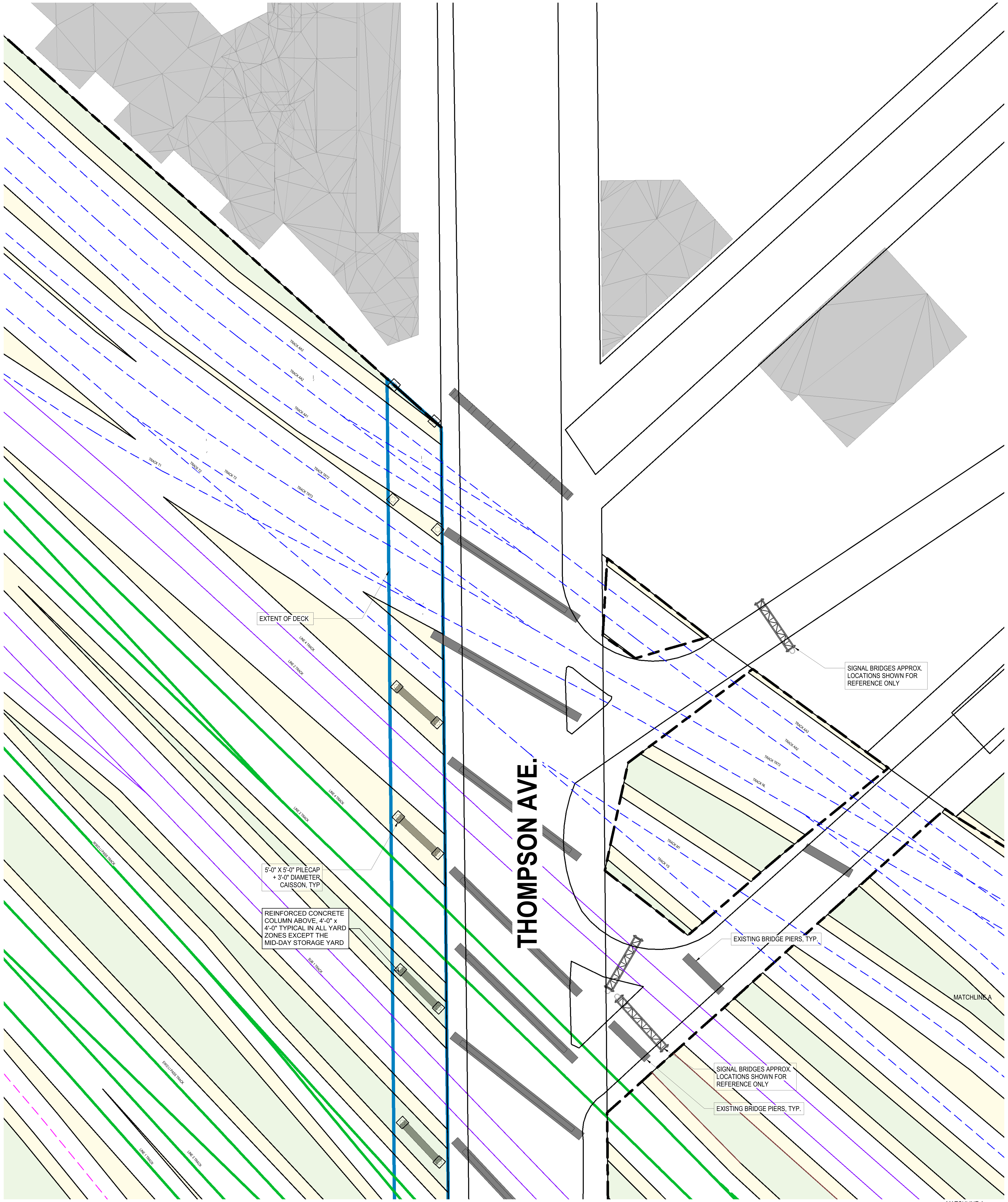
STRUCTURE

Title

PRIMER PHASE - THOMSON AVENUE

Thornton Tomasetti

Designed by	CCG/DPO
Drawn by	AP
Checked by	JB
Date	09/06/2019
Drawing Number	S-195



1 THOMSON AVE BRDG - FOUNDATION PLAN - NORTH

SCALE: 3/64" = 1'-0"

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE 3' CLEARANCE CUT AND COVER TUNNELS 10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE

- PRIMER PHASE BOUNDARY

NYCEDC

STRUCTURE

PRIMER PHASE - THOMSON AVENUE

Thornton Tomasetti

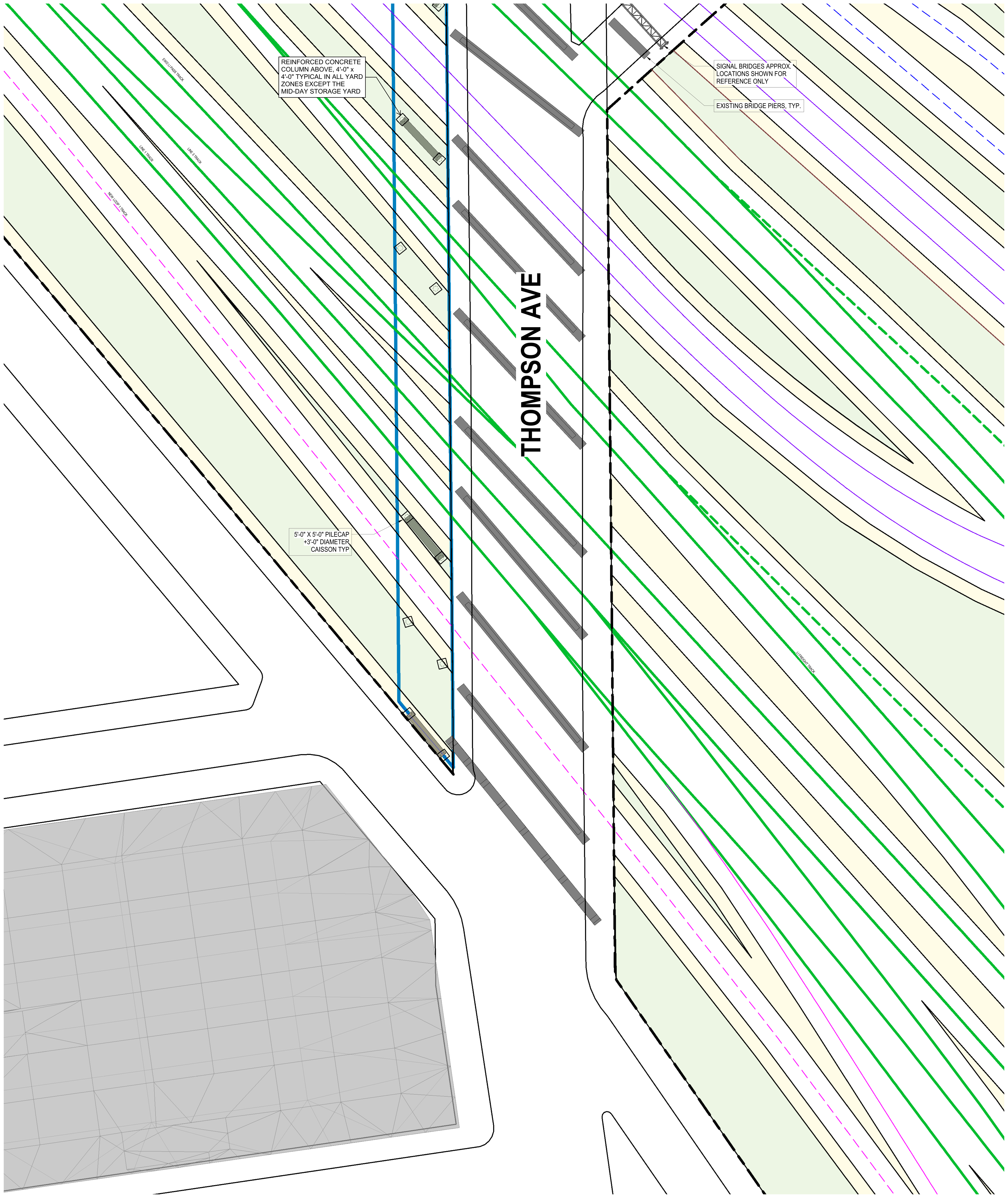
CCG/DPO

AP

JB

09/13/2019

S-195A



1 **THOMSON AVE BRDG - FOUNDATION PLAN - SOUTH**

SCALE: 3/64" = 1'-0"

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE 3' CLEARANCE CUT AND COVER TUNNELS 10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

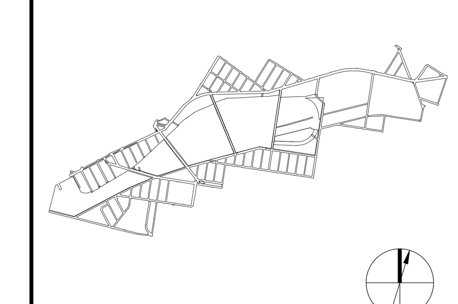
STRUCTURE

- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE

- PRIMER PHASE BOUNDARY

NYCEDC



STRUCTURE

PRIMER PHASE - THOMSON AVENUE

Thornton Tomasetti

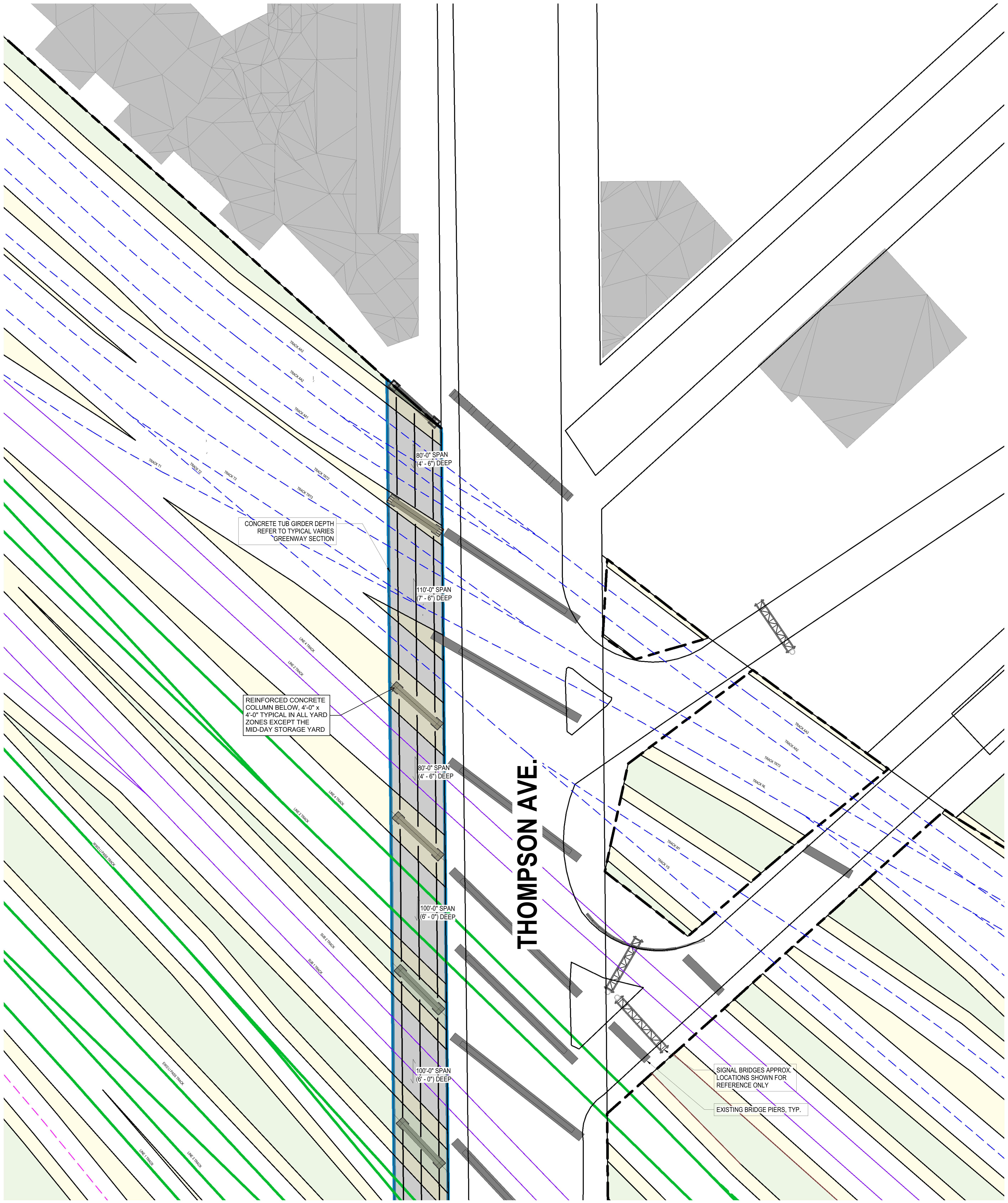
CCG/DPO

AP

JB

09/13/2019

S-195B



1 THOMSON AVE BRDG - FRAMING PLAN - NORTH

SCALE: 3/64" = 1'-0"

LEGEND

HORIZONTAL CLEARANCE
- 8'-6" ABSOLUTE CLEARANCE LINE 3' CLEARANCE CUT AND COVER TUNNELS 10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS
- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES
- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE
- PRIMER PHASE BOUNDARY

NYCEDC

STRUCTURE

PRIMER PHASE - THOMSON AVENUE

Thornton Tomasetti

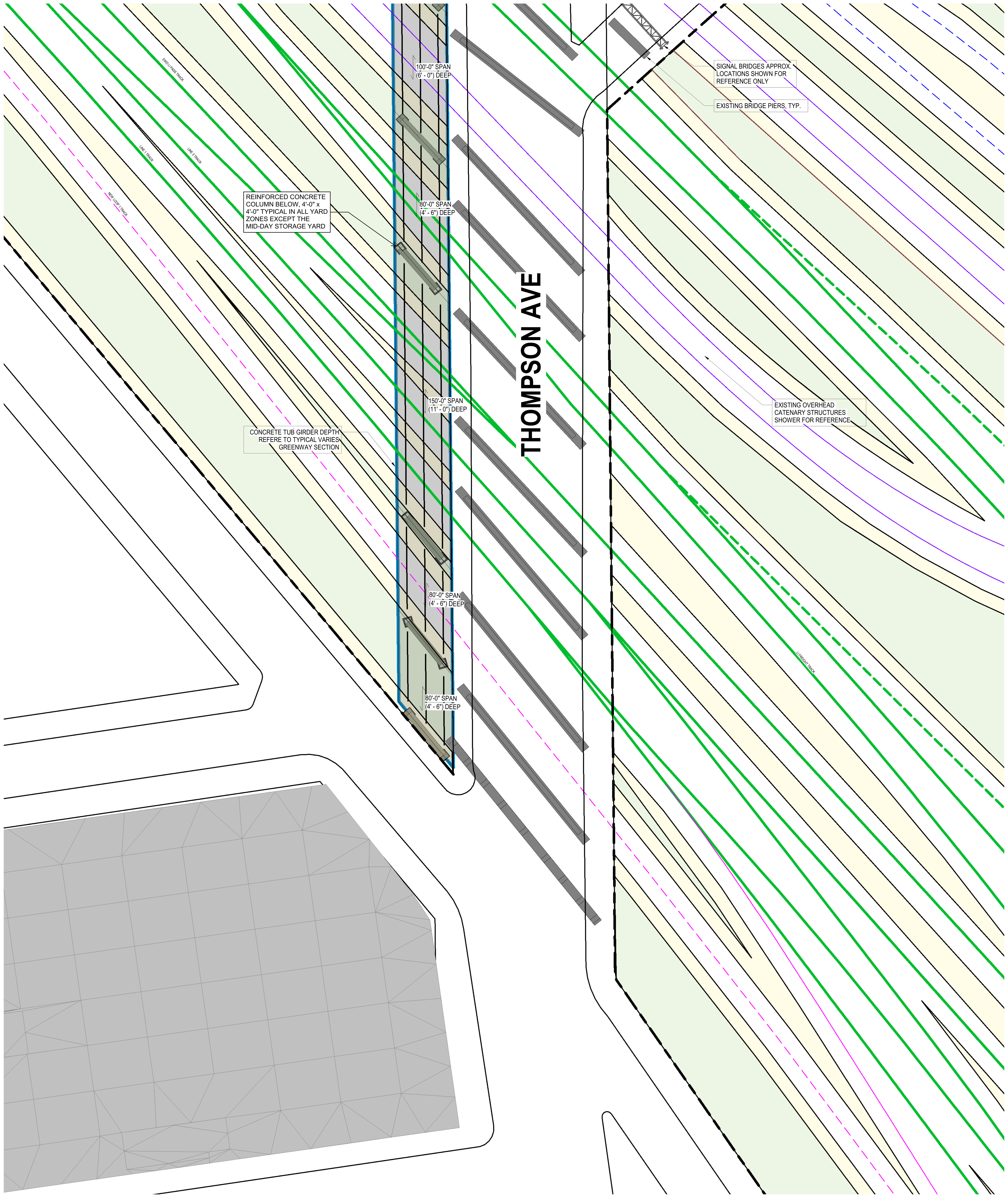
CCG/DPO

AP

JB

09/06/2019

S-195C



1 THOMSON AVE BRDG - FRAMING PLAN - SOUTH

SCALE: 3/64" = 1'-0"

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE
  3' CLEARANCE CUT AND COVER TUNNELS
  10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

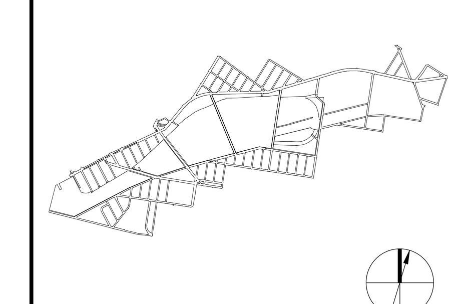
STRUCTURE

- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE

- PRIMER PHASE BOUNDARY

NYCEDC



STRUCTURE

PRIMER PHASE - THOMSON AVENUE

Thornton Tomasetti

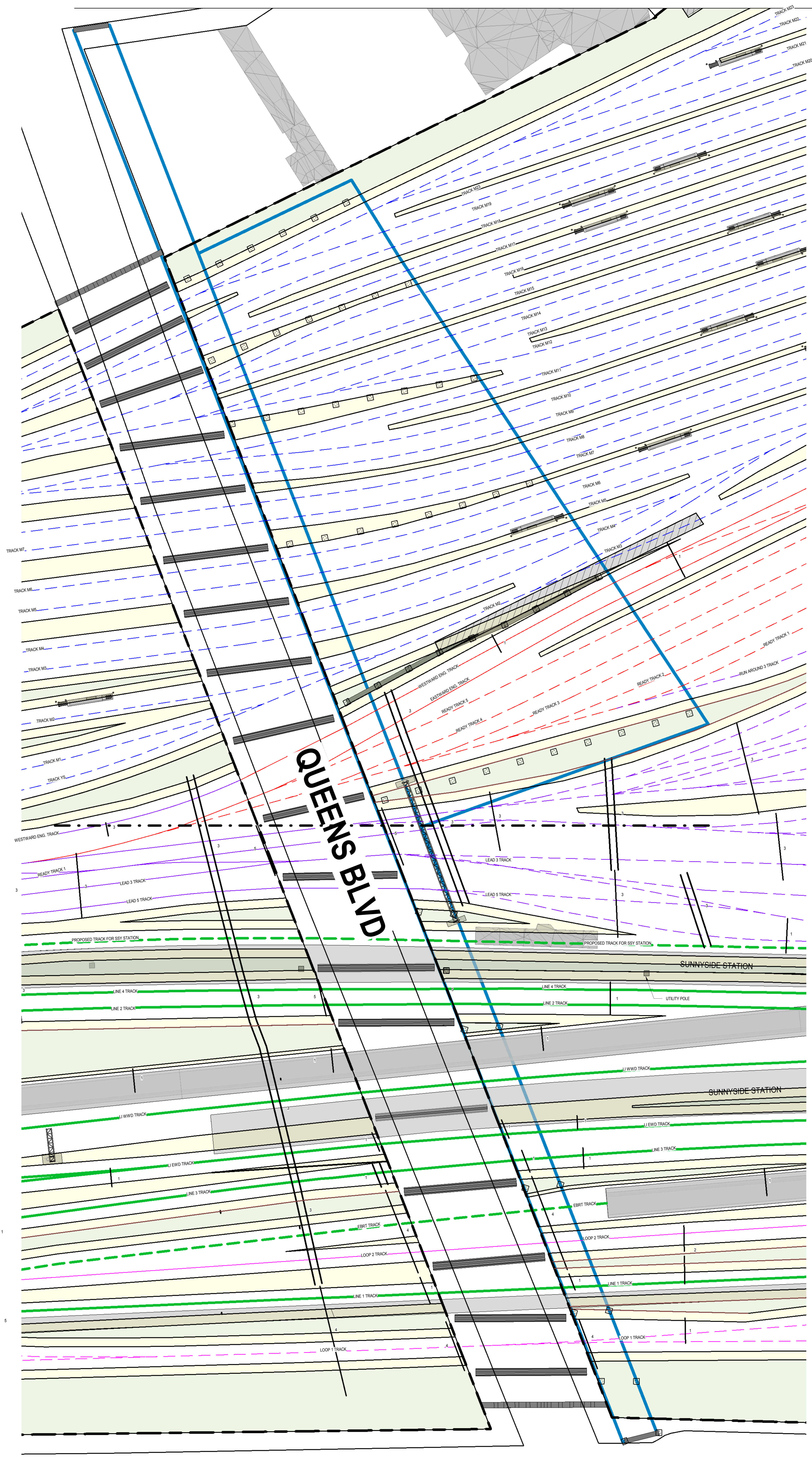
CCG/DPO

AP

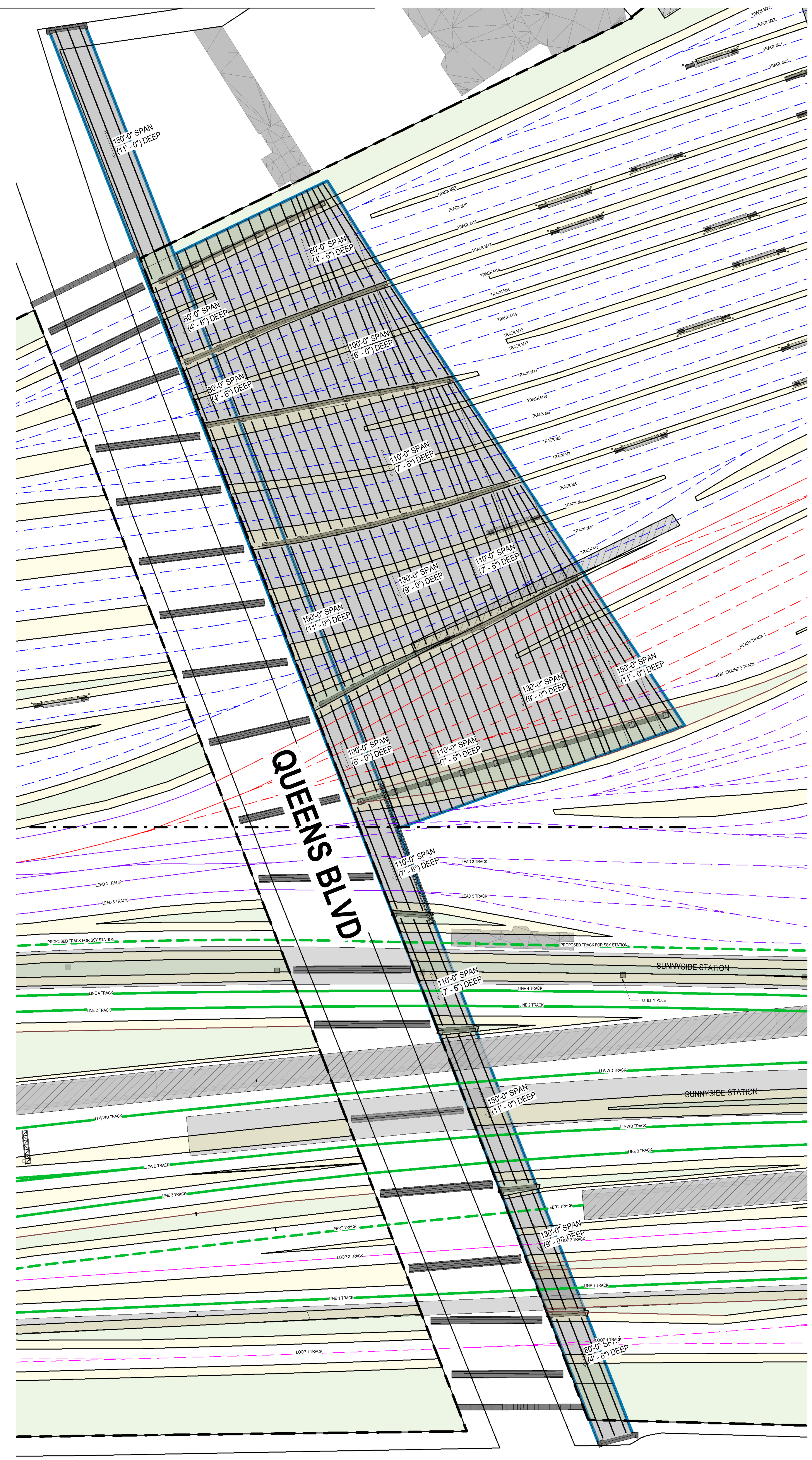
JB

09/13/2019

S-195D



1 QUEENS BLVD BRIDGE - FOUNDATION PLAN - PRIMER PHASE
SCALE: 1" = 40'-0"



2 QUEENS BLVD BRIDGE - FRAMING PLAN - PRIMER PHASE
SCALE: 1" = 40'-0"

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE 3' CLEARANCE CUT AND COVER TUNNELS 10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE

- PRIMER PHASE BOUNDARY

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

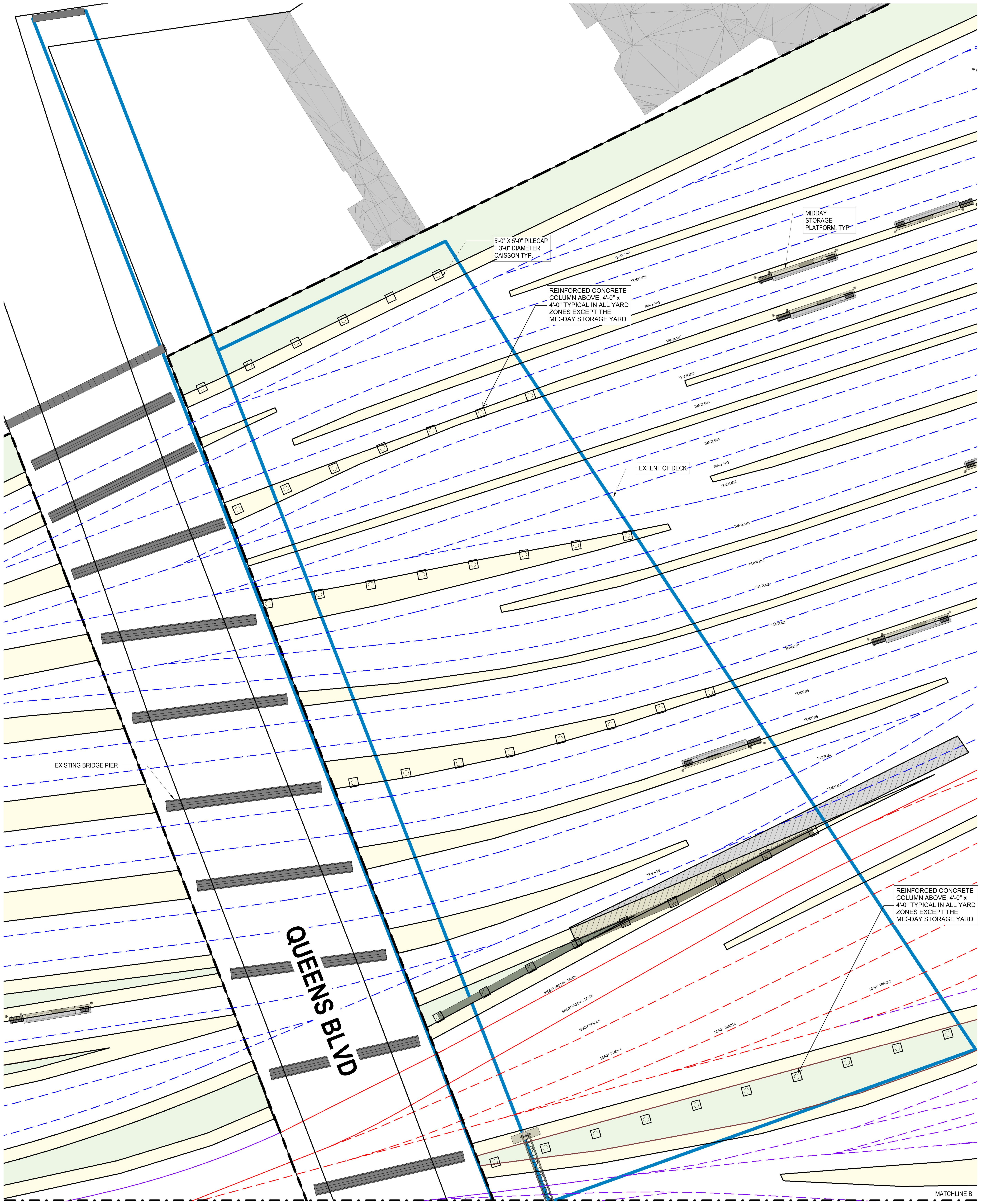
Key Plan

Discipline:
STRUCTURE

Title
PRIMER PHASE - QUEENS BLVD

Thornton Tomasetti

Designed by	CCG/DPO
Drawn by	AP
Checked by	JB
Date	09/13/2019
Drawing Number	S-196



1 QUEENS BLVD BRDG - FOUNDATION PLAN - NORTH

SCALE: 3/64" = 1'-0"

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE; 3' CLEARANCE CUT AND COVER TUNNELS; 10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

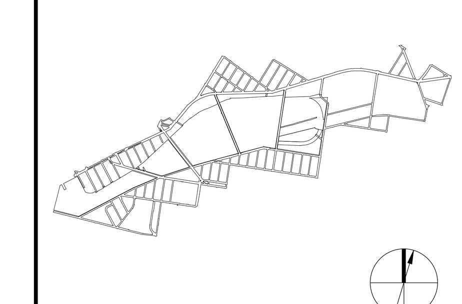
STRUCTURE

- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE

- PRIMER PHASE BOUNDARY

NYCEDC



STRUCTURE

PRIMER PHASE - QUEENS BLVD

Thornton Tomasetti

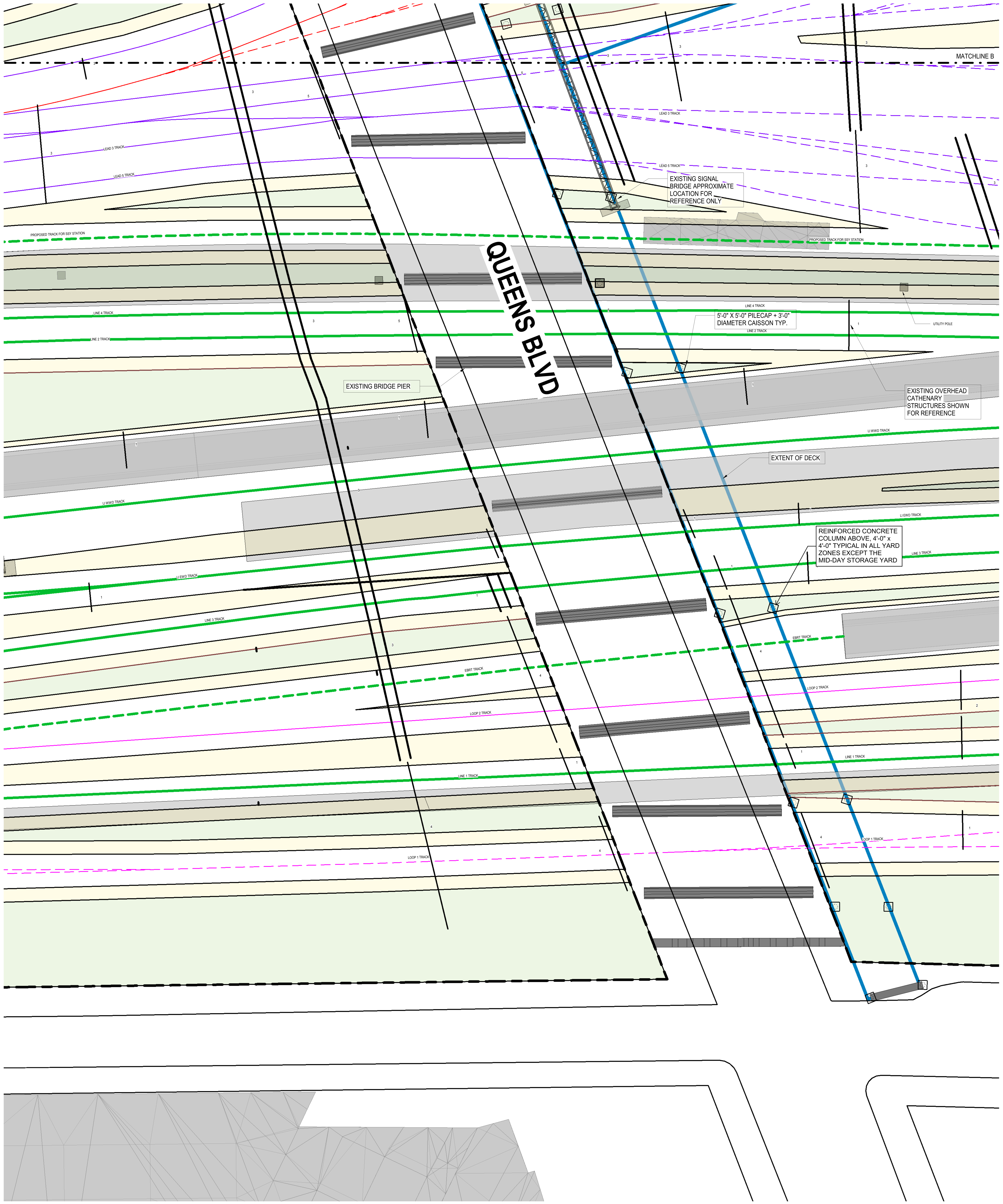
CCG/DPO

AP

JB

09/06/2019

S-196A



1 **QUEENS BLVD BRDG - FOUNDATION PLAN - SOUTH**

SCALE: 3/64" = 1'-0"

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE
  3' CLEARANCE CUT AND COVER TUNNELS
  10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

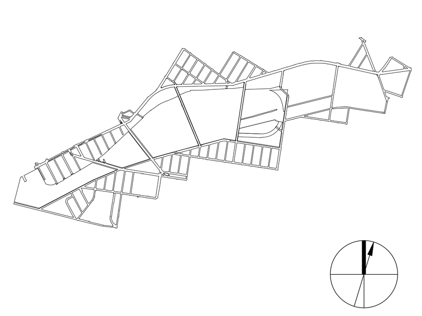
STRUCTURE

- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE

- PRIMER PHASE BOUNDARY

NYCEDC



STRUCTURE

PRIMER PHASE - QUEENS BLVD

Thornton Tomasetti

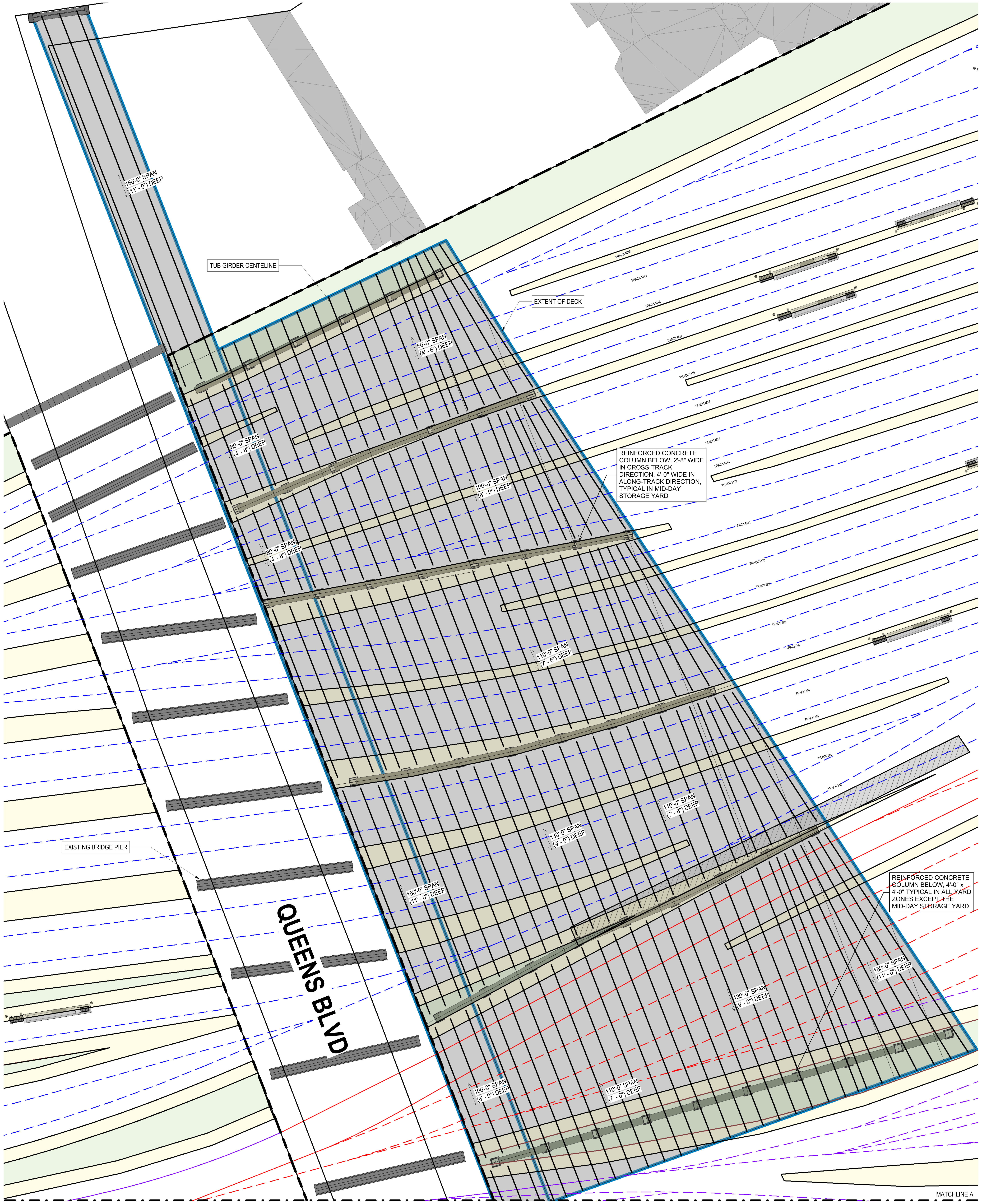
CCG/DPO

AP

JB

09/13/2019

S-196B



1 QUEENS BLVD BRDG - FRAMING PLAN - NORTH

SCALE: 3/64" = 1'-0"

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE 3' CLEARANCE CUT AND COVER TUNNELS 10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

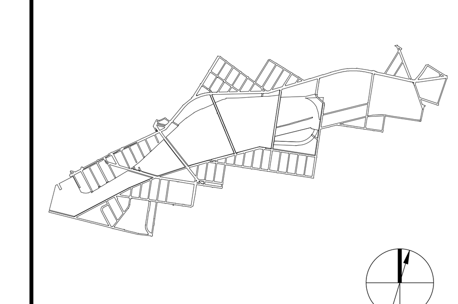
STRUCTURE

- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE

- PRIMER PHASE BOUNDARY

NYCEDC



STRUCTURE

PRIMER PHASE - QUEENS BLVD

Thornton Tomasetti

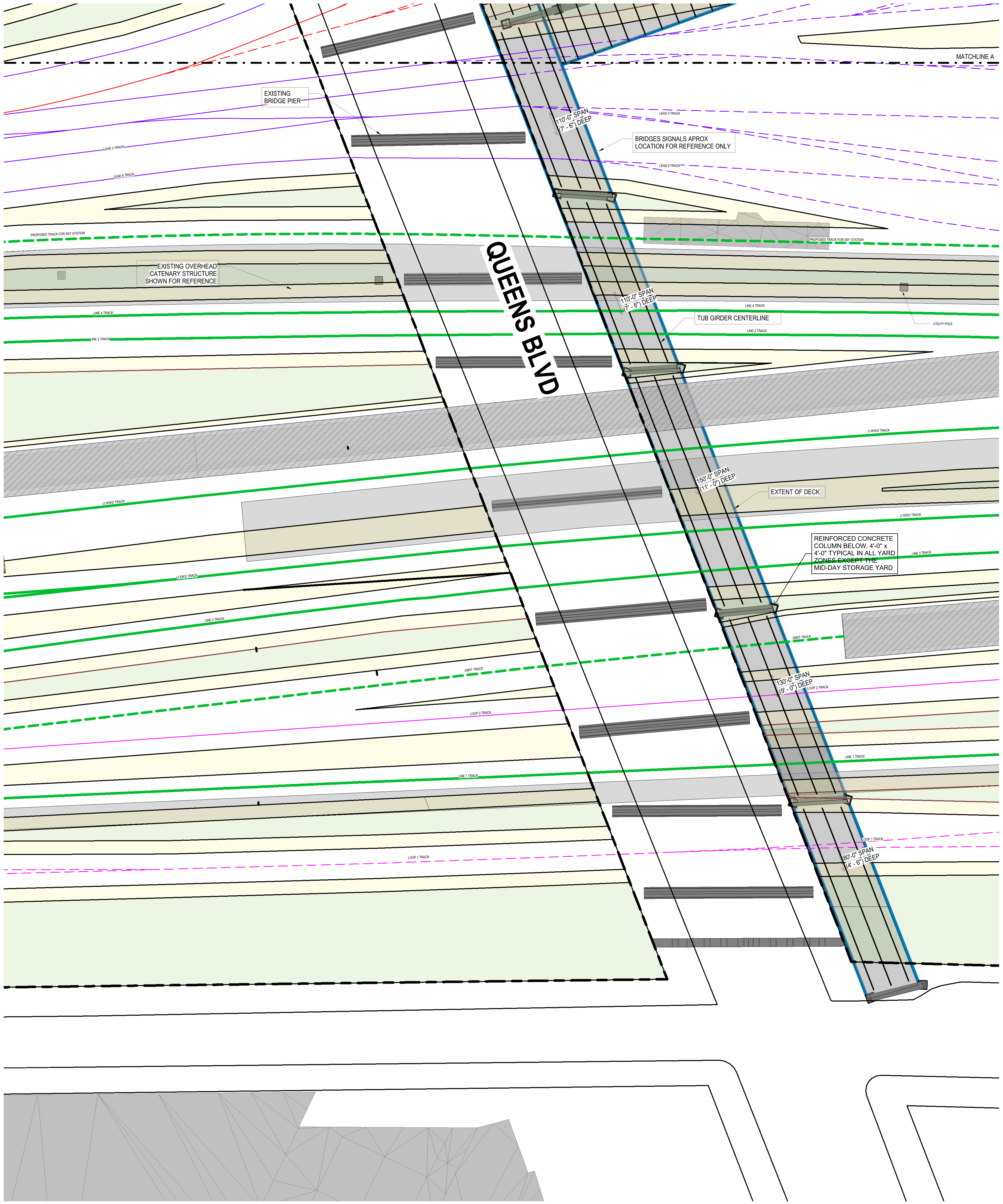
CCG/DPO

AP

JB

09/13/2019

S-196C



1 QUEENS BLVD BRDG - FRAMING PLAN - SOUTH

SCALE: 3/64" = 1'-0"

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE 3' CLEARANCE CUT AND COVER TUNNELS 10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

PRIMER PHASE

- PRIMER PHASE BOUNDARY

NYCEDC

STRUCTURE

PRIMER PHASE - QUEENS BLVD

Thornton Tomasetti

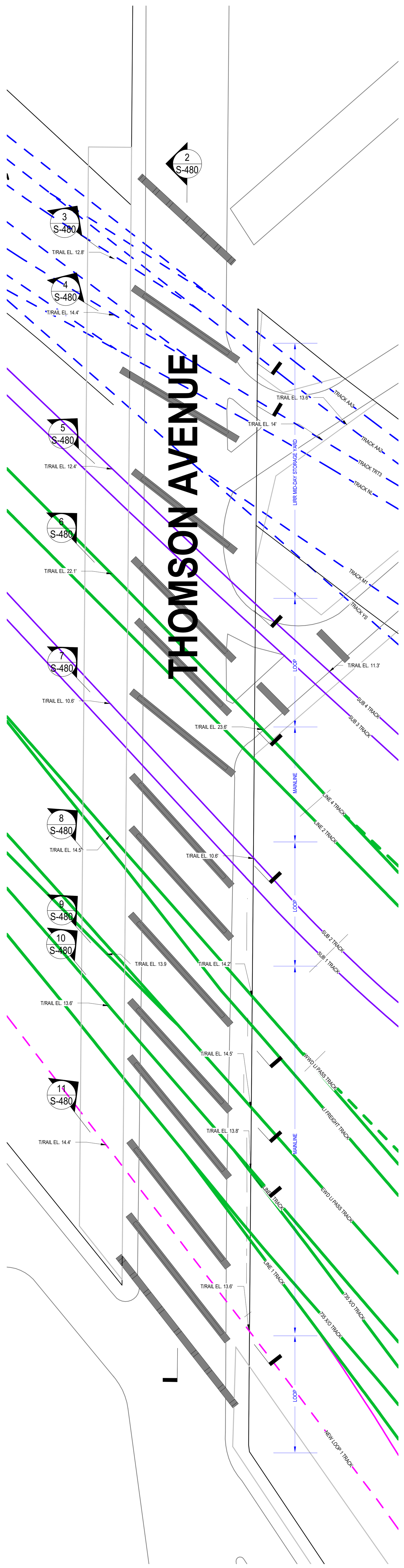
CCG/DPO

AP

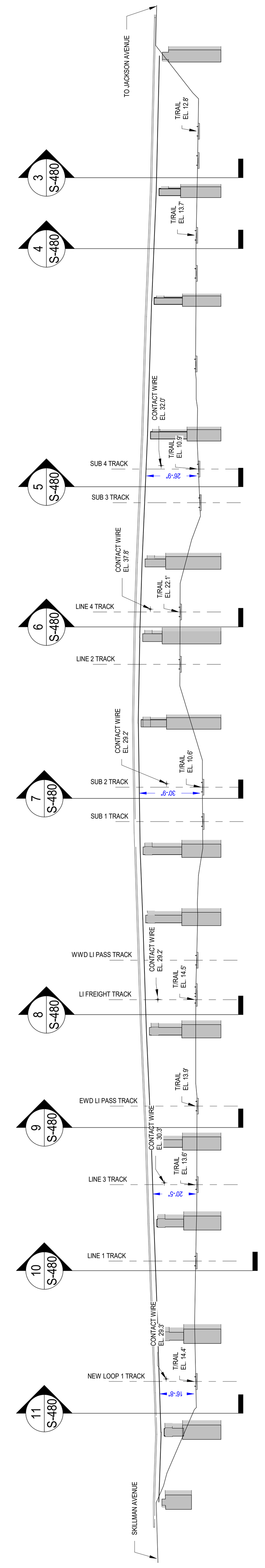
JB

09/13/2019

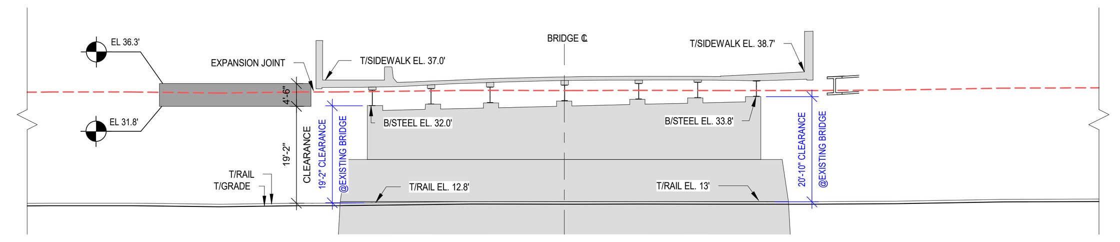
S-196D



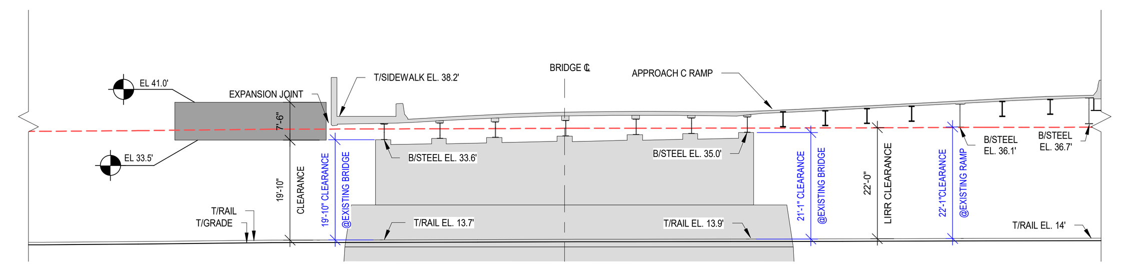
1 PARTIAL PLAN - THOMSON AVENUE BRIDGE
SCALE: 1" = 40'-0"



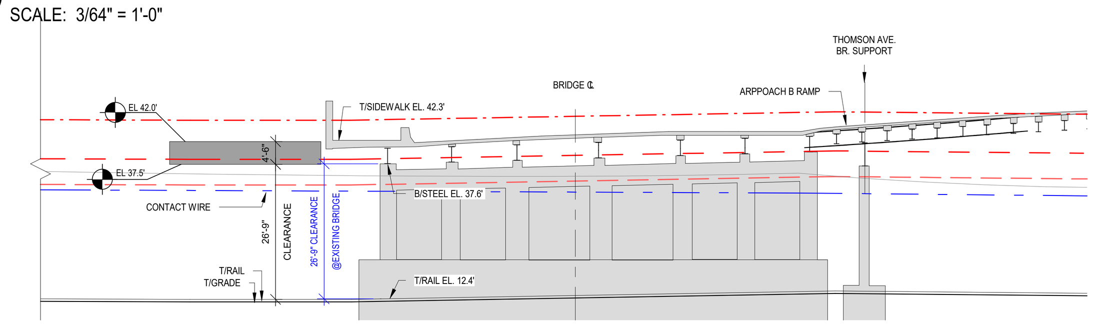
2 ELEVATION OF THOMSON AVENUE BRIDGE
SCALE: 1" = 40'-0"



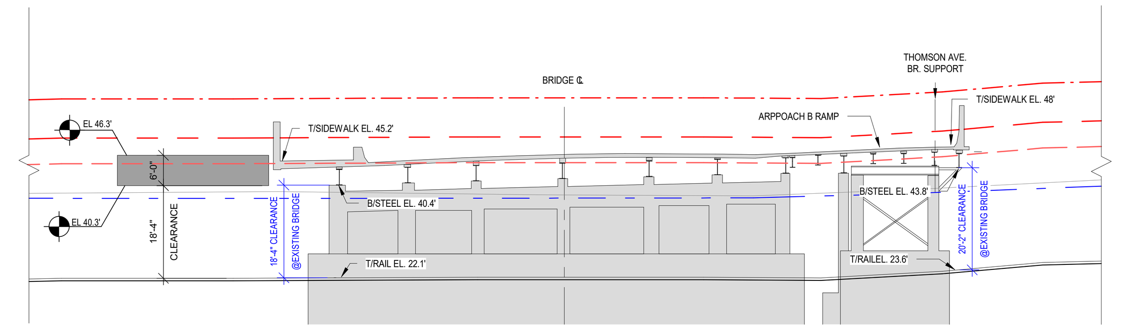
3 SECTION AT THOMSON AVENUE - A1 - TRACK AA3 - PRIMER PHASE - REF. 1/S-482
SCALE: 3/64" = 1'-0"



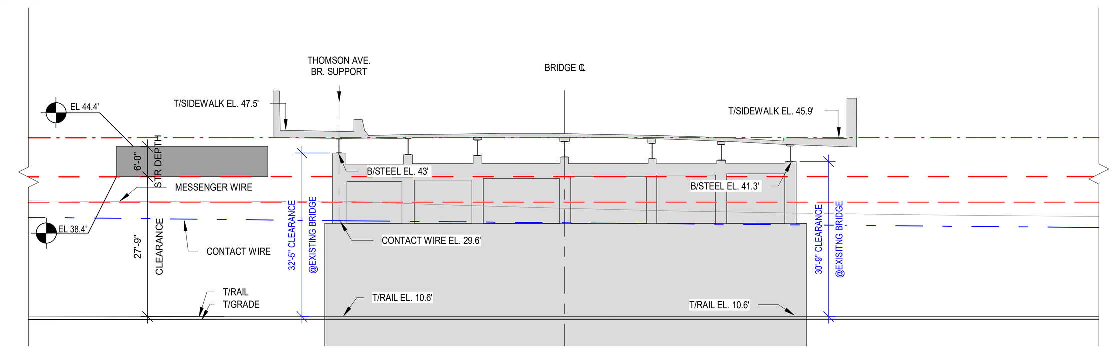
4 SECTION AT THOMSON AVENUE - TRACK TRT3 - REF. 2/S-482
SCALE: 3/64" = 1'-0"



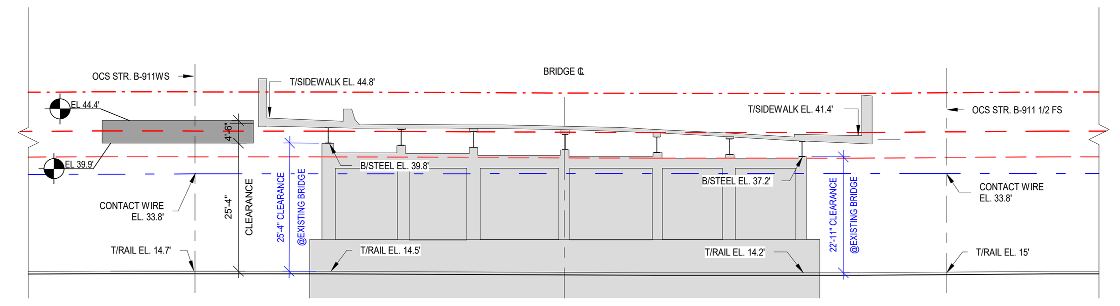
5 SECTION AT THOMSON AVENUE - A3 - SUB 4 TRACK - PRIMER PHASE - REF. 3/S-482
SCALE: 3/64" = 1'-0"



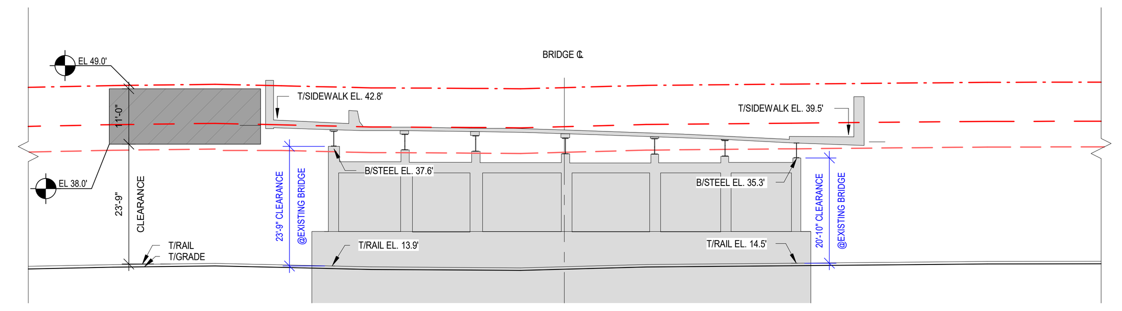
6 SECTION AT THOMSON AVENUE - A7 - LINE 4 TRACK - PRIMER PHASE - REF. 1/S-483
SCALE: 3/64" = 1'-0"



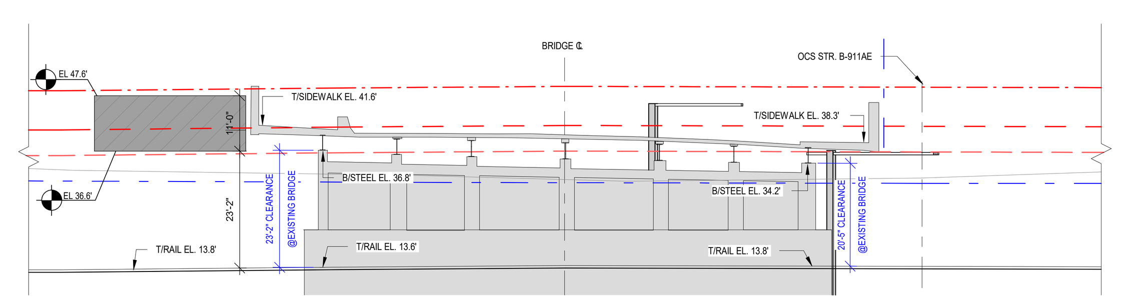
7 SECTION AT THOMSON AVENUE - A3.2 - SUB 2 TRACK - PRIMER PHASE - REF. 2/S-483
SCALE: 3/64" = 1'-0"



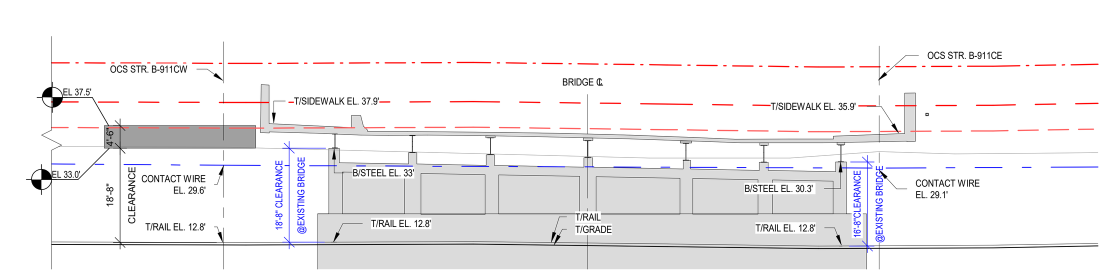
8 SECTION AT THOMSON AVENUE BRIDGE -a7.2 - PRIMER PHASE - REF. 3/S-483
SCALE: 3/64" = 1'-0"



9 SECTION AT THOMSON AVENUE - A7.3 - EWD LI PASS TRACK - PRIMER PHASE - REF. 1/S-484
SCALE: 3/64" = 1'-0"



10 SECTION AT THOMSON AVENUE - A7.4 - LINE 3 TRACK - PRIMER PHASE - REF. 2/S-484
SCALE: 3/64" = 1'-0"



11 SECTION AT THOMSON AVENUE - A8 - NEW LOOP 1 TRACK - PRIMER PHASE - REF.3/S-484
SCALE: 3/64" = 1'-0"

LEGEND

TYPICAL LOADING

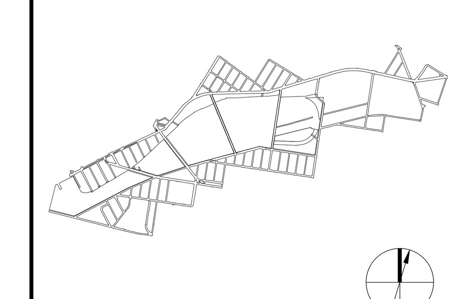
REDUCED LOADING

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan

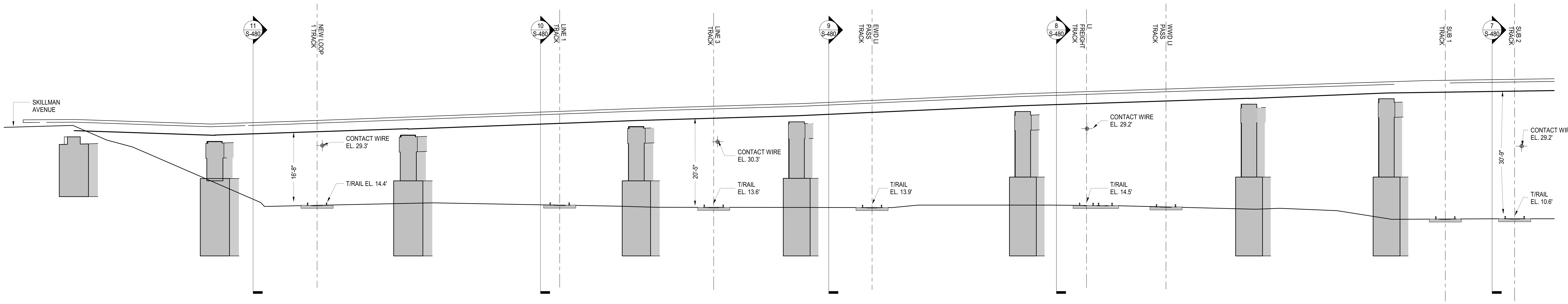


Discipline:
STRUCTURE

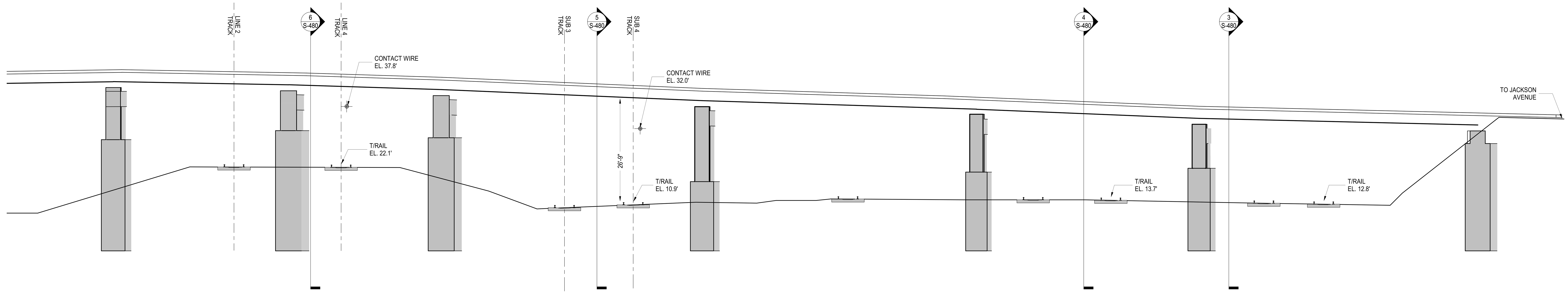
Title
THOMSON AVENUE BRIDGE SECTIONS

Thornton Tomasetti

Designed by	Designer
Drawn by	Author
Checked by	Checker
Date	08/08/19
Drawing Number	S-480



1 **ELEVATION OF THOMSON AVENUE BRIDGE**
SCALE: 1" = 10'-0"



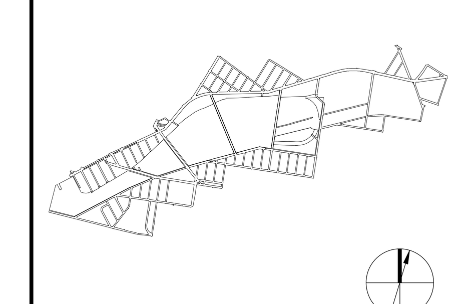
2 **ELEVATION OF THOMSON AVENUE BRIDGE**
SCALE: 1" = 10'-0"

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan

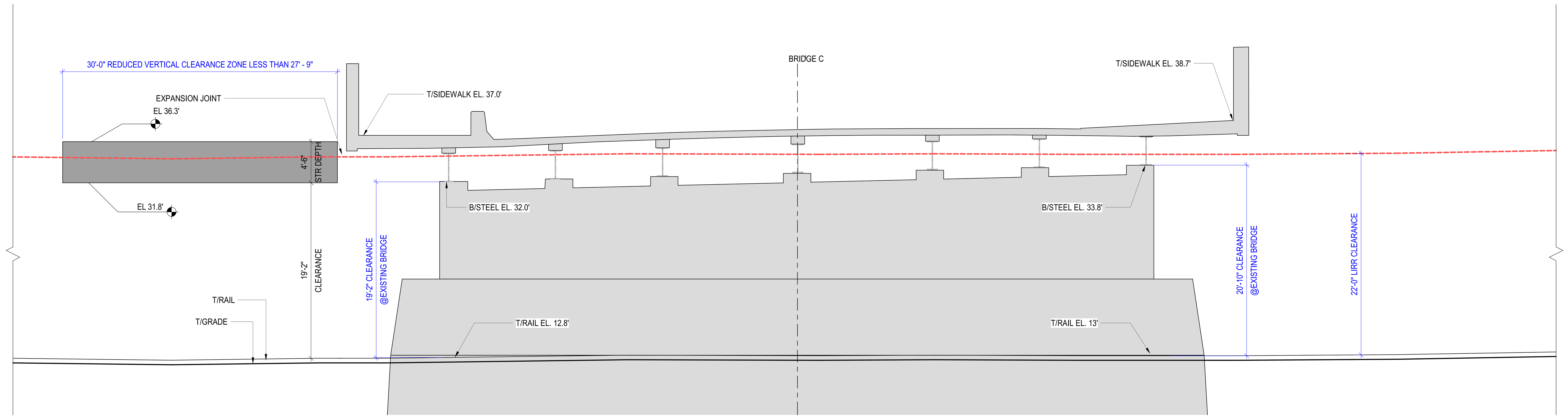


Discipline:
STRUCTURE

Title
THOMSON AVENUE - LONGITUDINAL BRIDGE SECTION

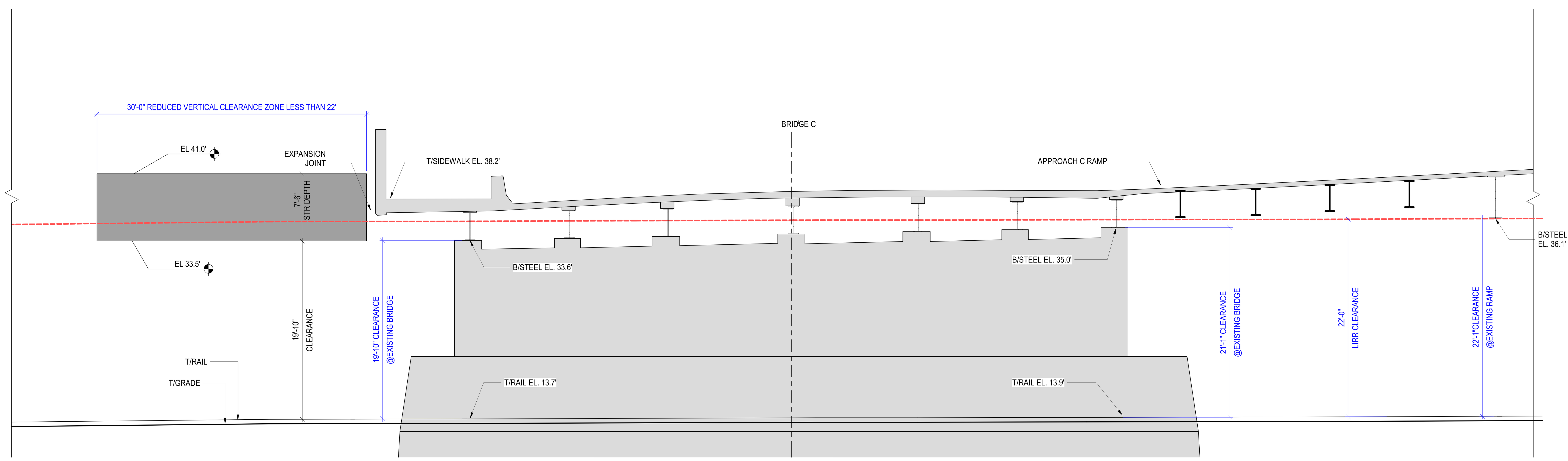
Thornton Tomasetti

Designed by	Designer
Drawn by	Author
Checked by	Checker
Date	09/12/19
Drawing Number	S-481



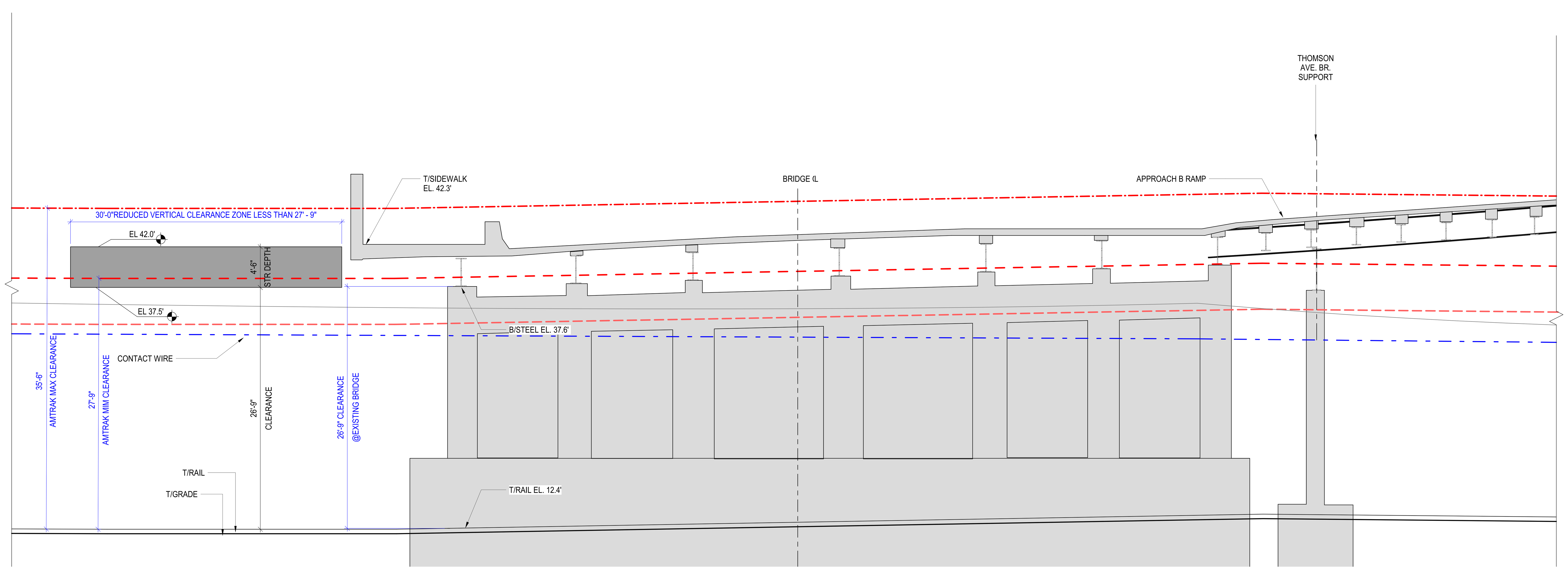
1 SECTION AT THOMSON AVENUE - A1 - TRACK AA3 - PRIMER PHASE

SCALE: 3/16" = 1'-0"



2 SECTION AT THOMSON AVENUE - TRACK TRT3 - PRIMER PHASE

SCALE: 3/16" = 1'-0"



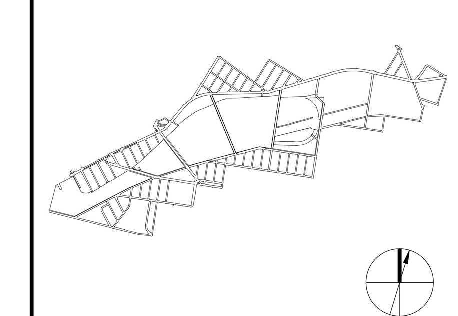
3 SECTION AT THOMSON AVENUE - A3 - SUB 4 TRACK - PRIMER PHASE

SCALE: 3/16" = 1'-0"

LEGEND

- TYPICAL LOADING
- REDUCED LOADING

NYCEDC



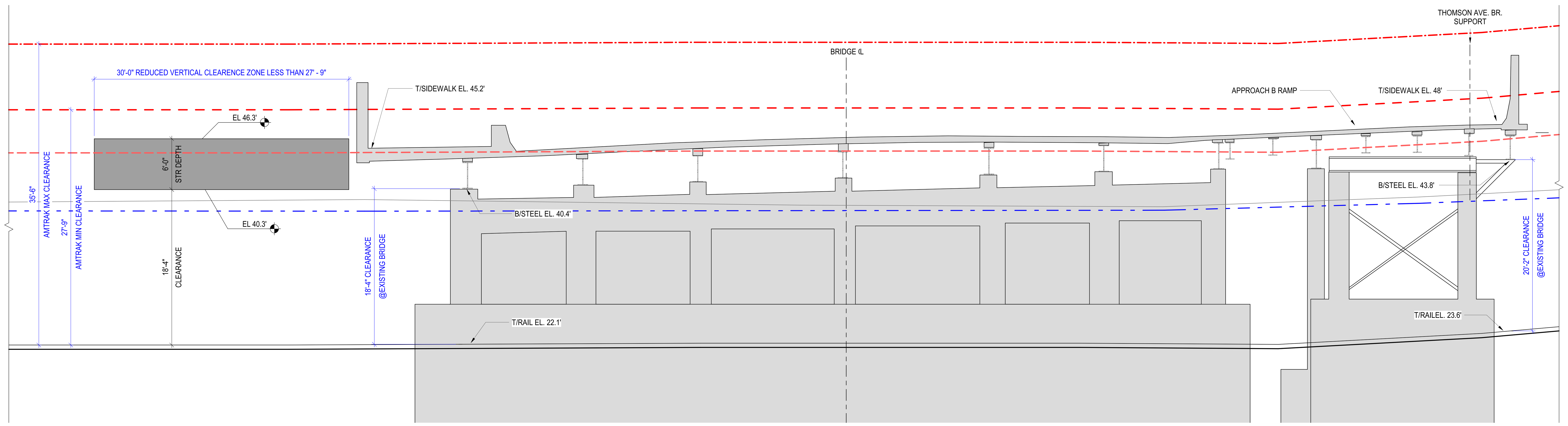
STRUCTURE

THOMSON AVENUE BRIDGE SECTIONS

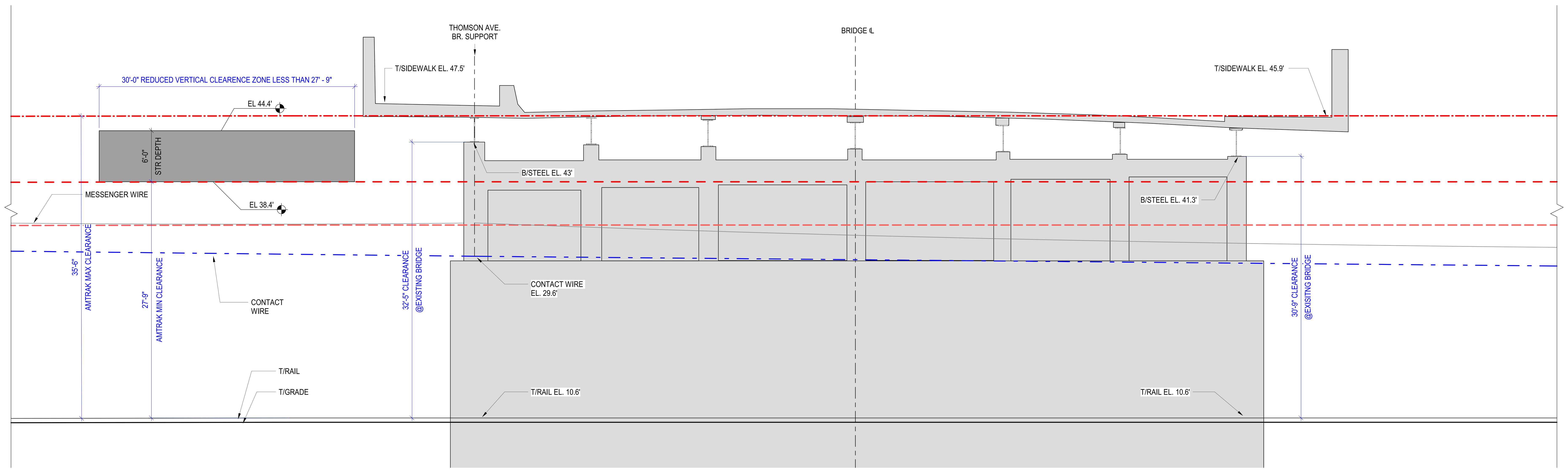
Thornton Tomasetti

Designer
Author
Checker
08/30/19

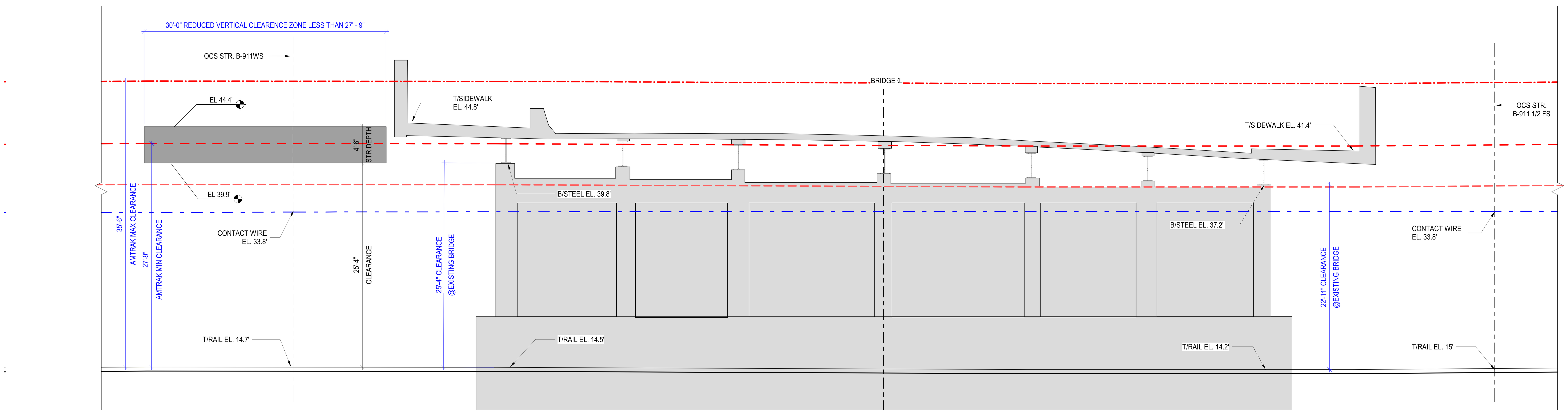
S-482



1 SECTION AT THOMSON AVENUE - A7 - LINE 4 TRACK - PRIMER PHASE
SCALE: 3/16" = 1'-0"



2 SECTION AT THOMSON AVENUE - A3.2 - SUB 2 TRACK - PRIMER PHASE
SCALE: 3/16" = 1'-0"

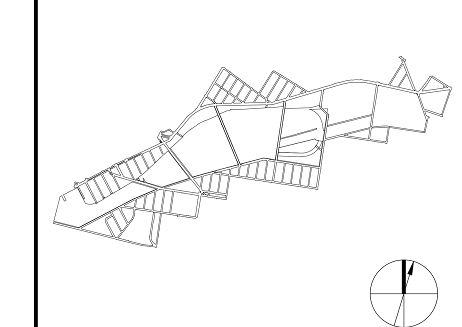


3 SECTION AT THOMSON AVENUE BRIDGE -a7.2
SCALE: 3/16" = 1'-0"

LEGEND

- TYPICAL LOADING
- REDUCED LOADING

NYCEDC



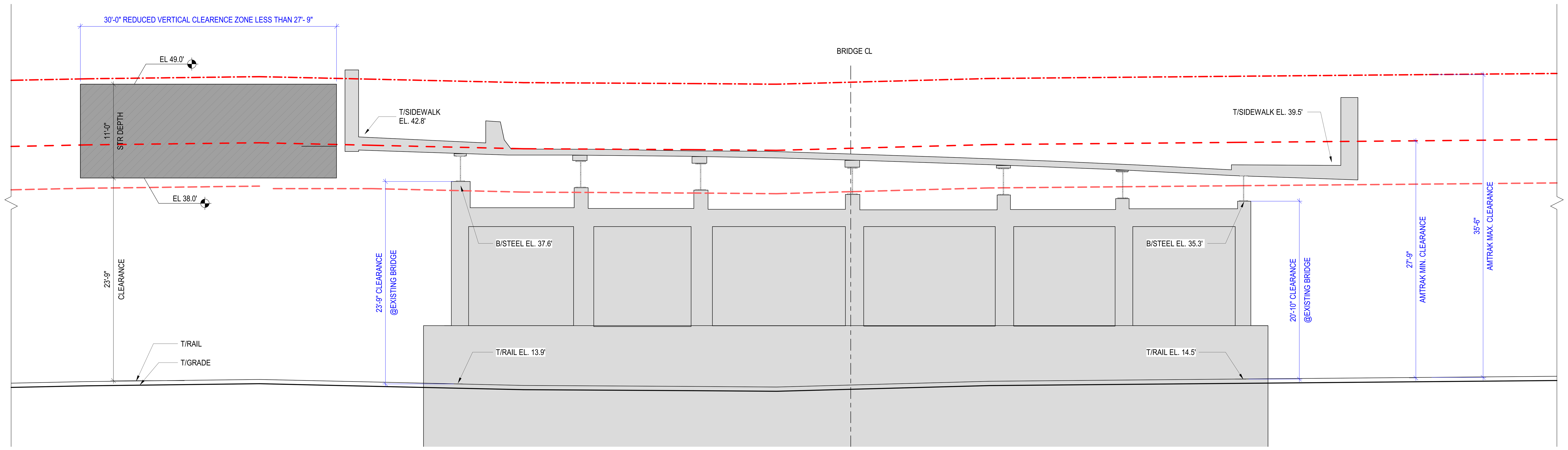
STRUCTURE

THOMSON AVENUE BRIDGE SECTIONS

Thornton Tomasetti

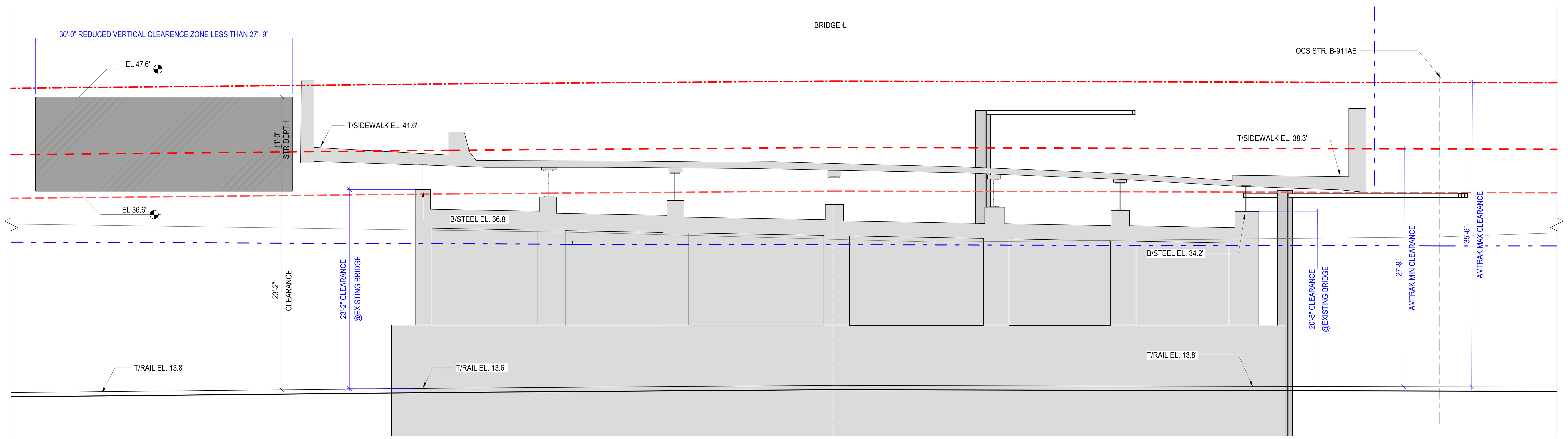
Designer
Author
Checker
08/30/19

S-483



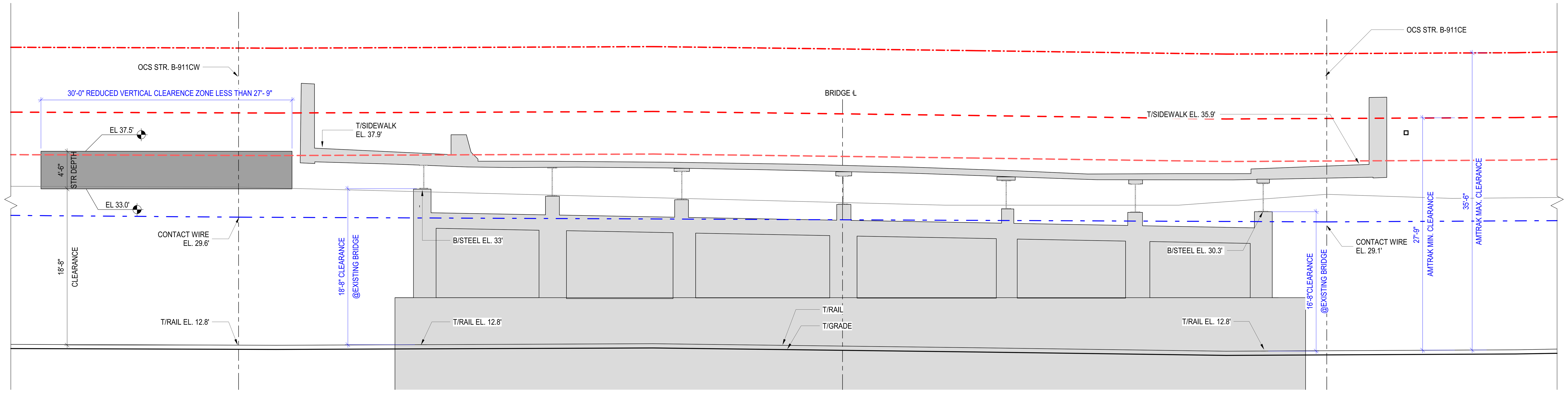
1 SECTION AT THOMSON AVENUE - A7.3 - EWD LI PASS TRACK - PRIMER PHASE

SCALE: 3/16" = 1'-0"



2 SECTION AT THOMSON AVENUE - A7.4 - LINE 3 TRACK - PRIMER PHASE

SCALE: 3/16" = 1'-0"



3 SECTION AT THOMSON AVENUE - A8 - NEW LOOP 1 TRACK - PRIMER PHASE

SCALE: 3/16" = 1'-0"

LEGEND

- TYPICAL LOADING
- REDUCED LOADING

NYCEDC

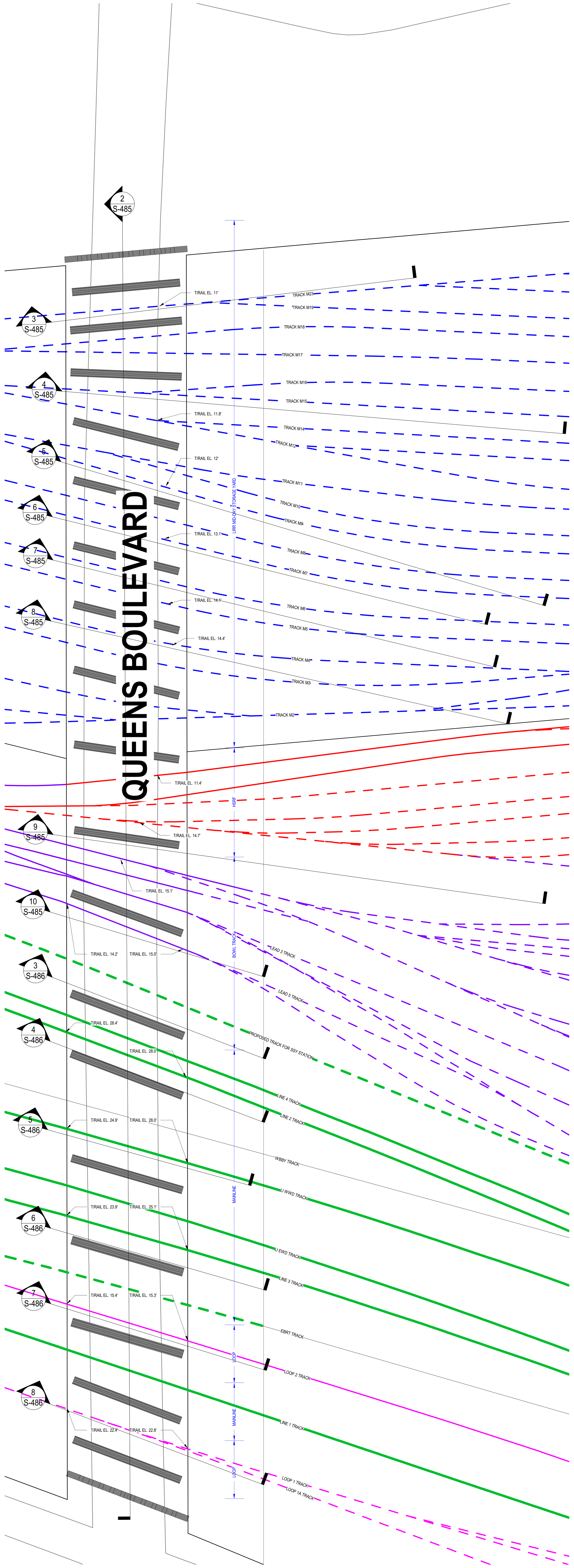
STRUCTURE

THOMSON AVENUE BRIDGE SECTIONS

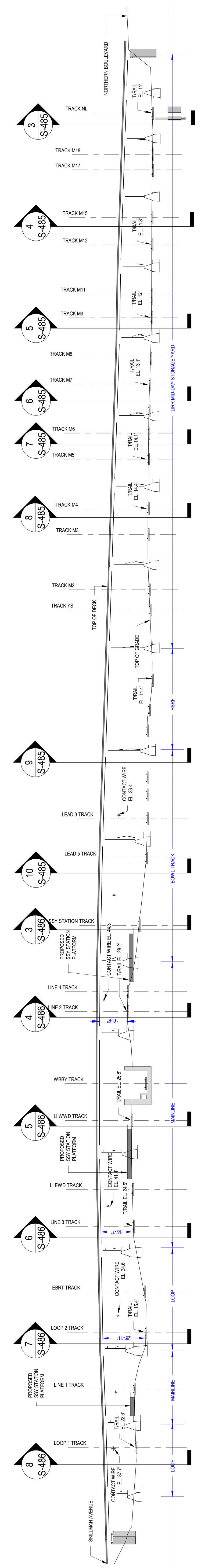
Thornton Tomasetti

Designer
Author
Checker
08/30/19

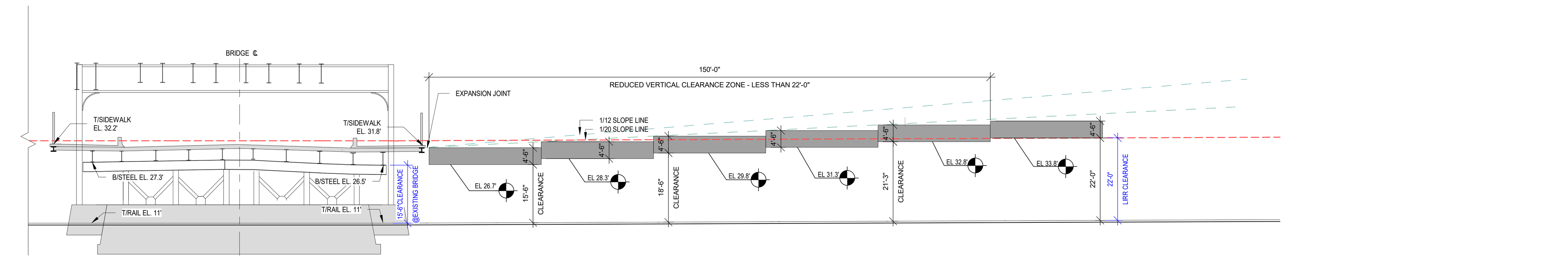
S-484



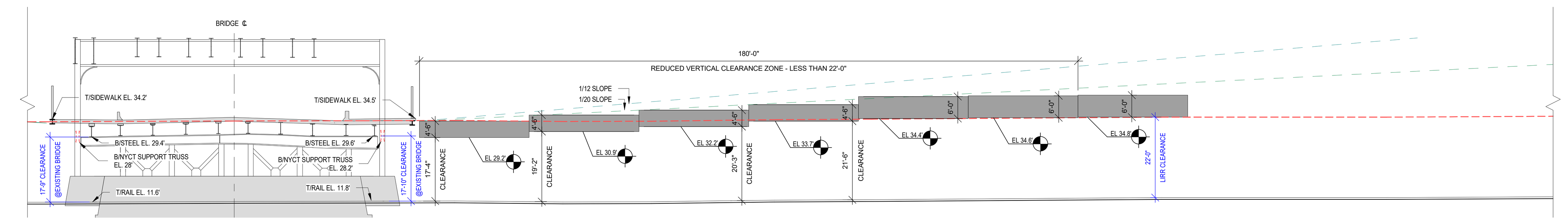
1 PARTIAL PLAN - QUEENS BOULEVARD BRIDGE
SCALE: 1" = 40'-0"



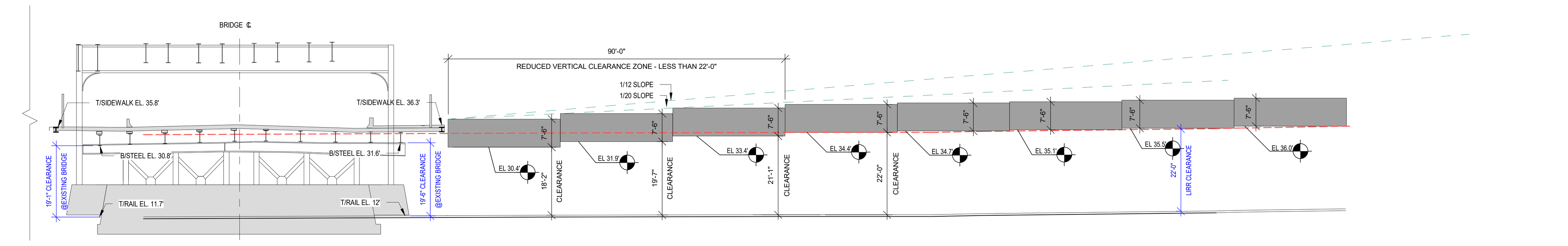
2 ELEVATION OF QUEENS BOULEVARD BRIDGE
SCALE: 1" = 40'-0"



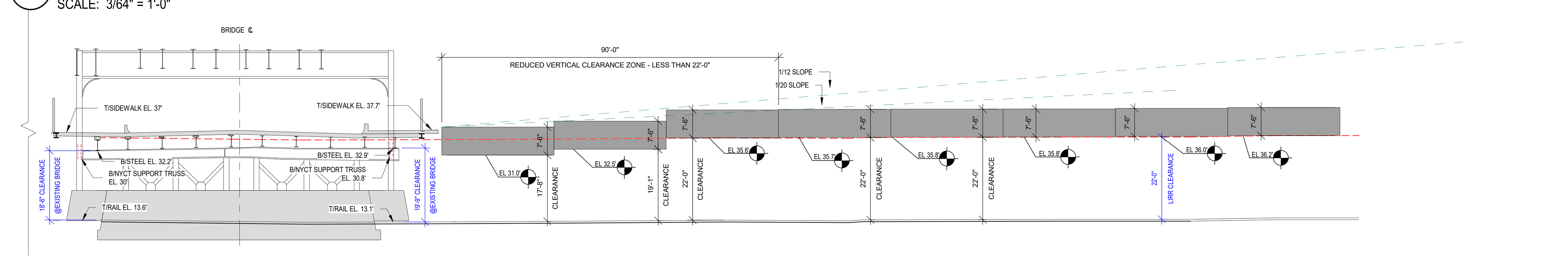
3 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK NL - REF. 1&2/S-488
SCALE: 3/64" = 1'-0"



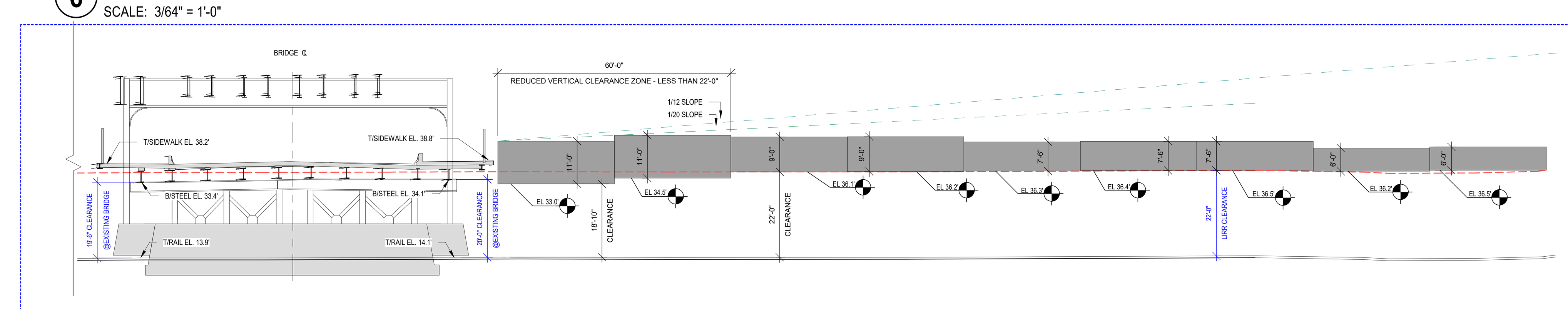
4 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M12 - REF. 1&2/S-489
SCALE: 3/64" = 1'-0"



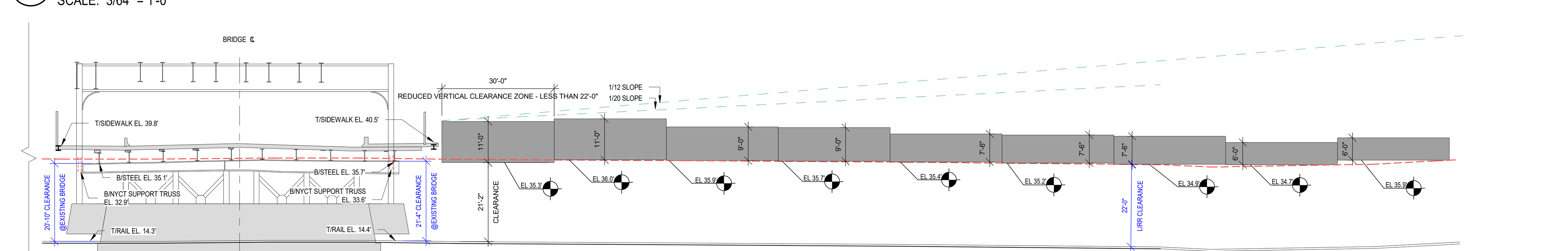
5 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M9 - REF. 1&2/S-490
SCALE: 3/64" = 1'-0"



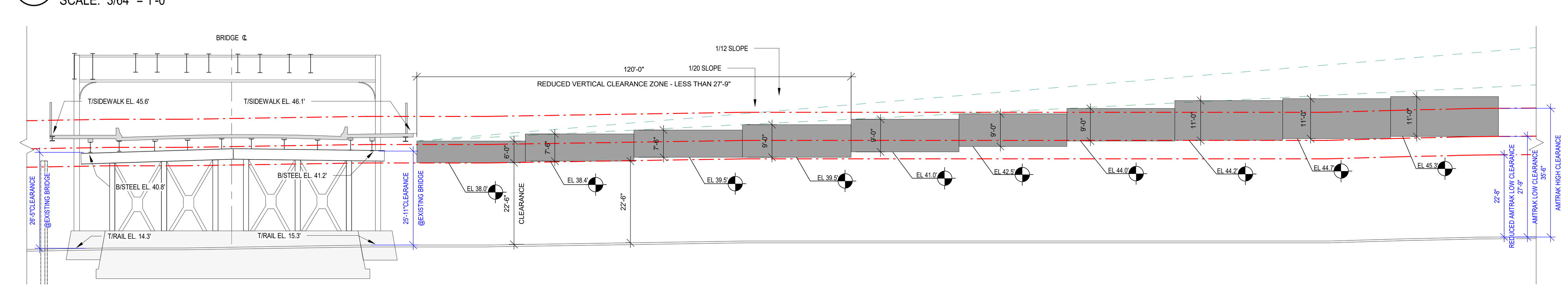
6 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M7 - REF. 1&2/S-491
SCALE: 3/64" = 1'-0"



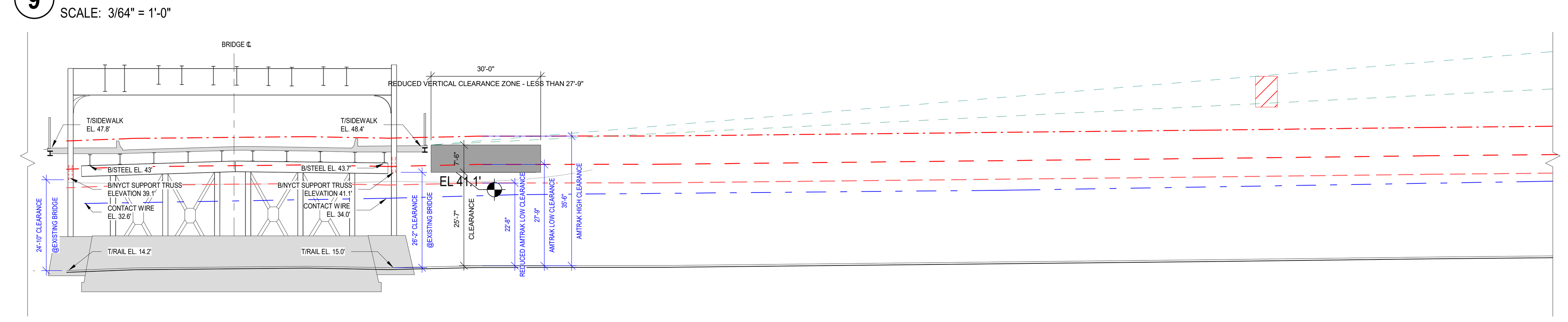
7 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M6 - REF. 1&2/S-492
SCALE: 3/64" = 1'-0"



8 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M4 - REF. 1&2/S-493
SCALE: 3/64" = 1'-0"



9 SECTION AT QUEENS BOULEVARD BRIDGE - PRIMER PHASE - REF. 1&2/S-494
SCALE: 3/64" = 1'-0"



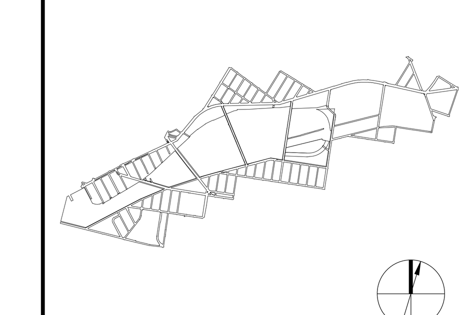
10 SECTION AT QUEENS BOULEVARD BRIDGE - LEAD 5 TRACK - REF. 1&2/S-495
SCALE: 3/64" = 1'-0"

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan

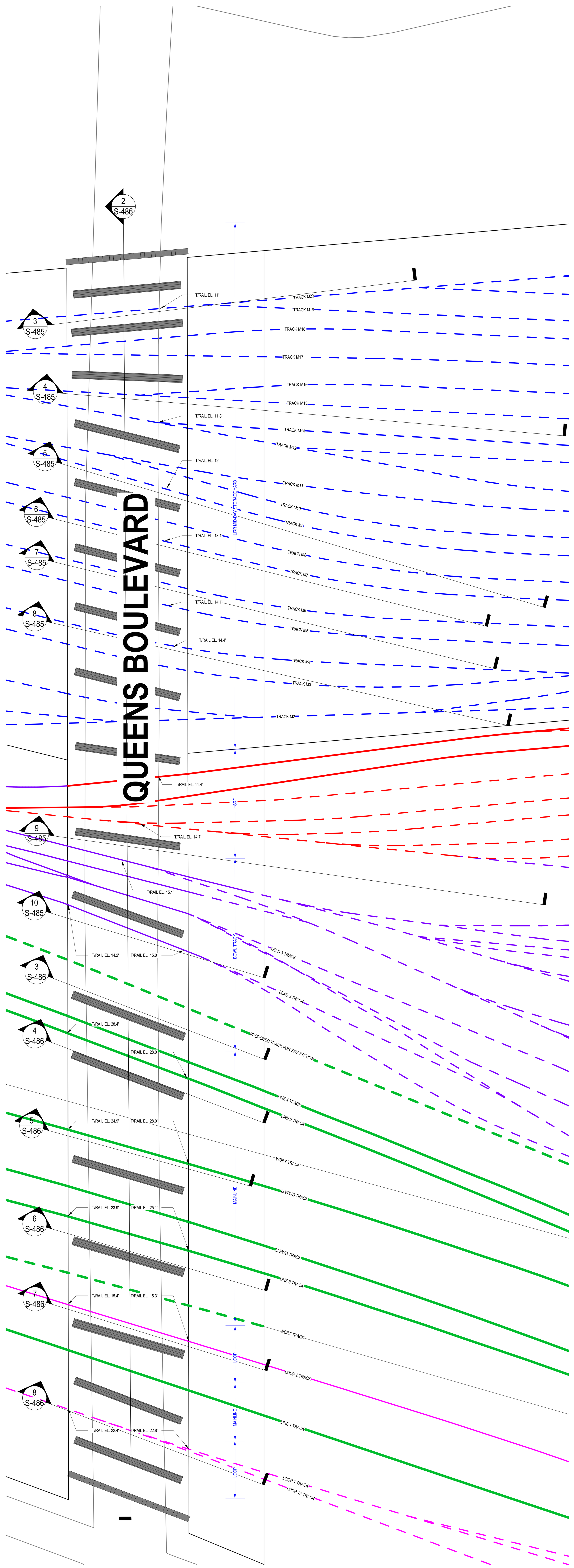


Discipline:
STRUCTURE

Title
QUEENS BOULEVARD BRIDGE SECTIONS

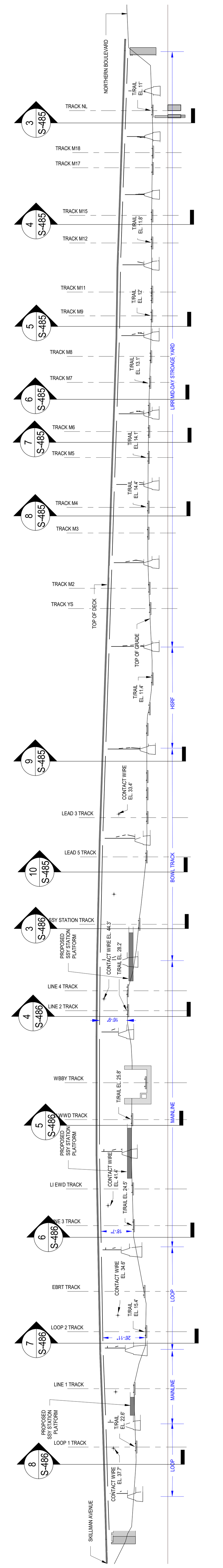
Thornton Tomasetti

Designed by	Designer
Drawn by	Author
Checked by	Checker
Date	08/11/19
Drawing Number	S-485



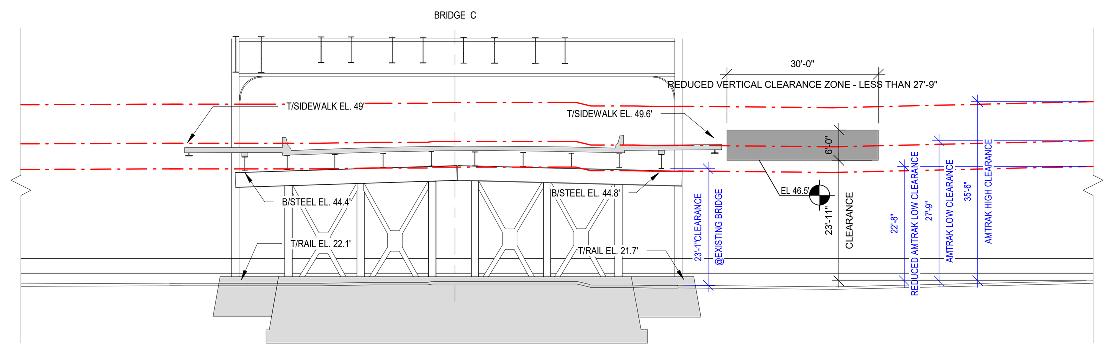
1 PARTIAL PLAN - QUEENS BOULEVARD BRIDGE

SCALE: 1" = 40'-0"



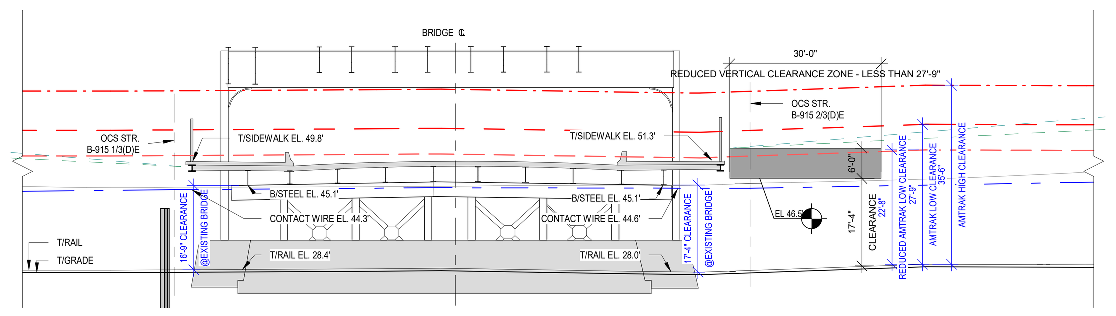
2 ELEVATION OF QUEENS BOULEVARD BRIDGE

SCALE: 1" = 40'-0"



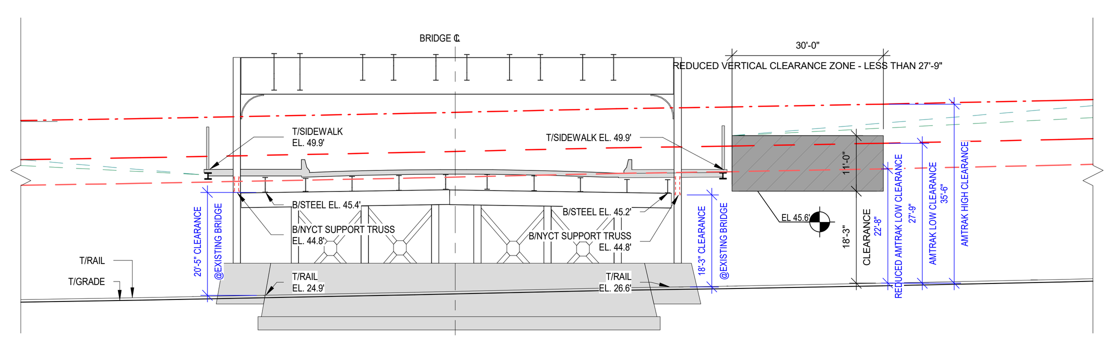
3 SECTION AT QUEENS BOULEVARD BRIDGE - PROPOSED TRACK FOR SSY - REF. 2/S-495

SCALE: 3/64" = 1'-0"



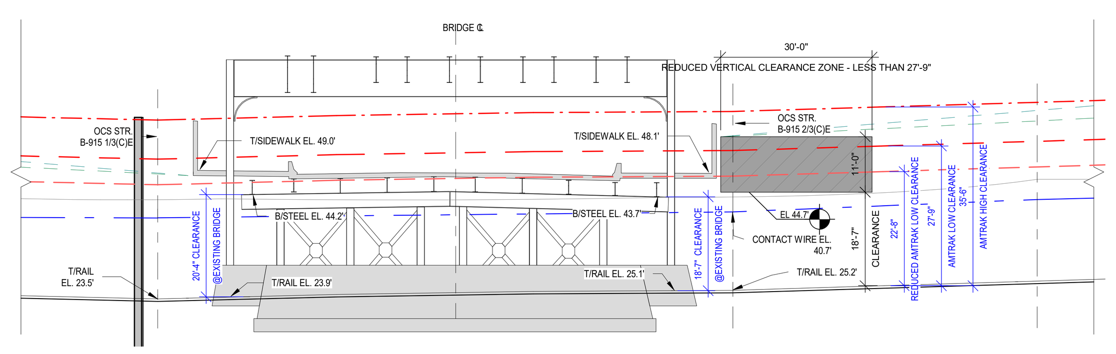
4 SECTION AT QUEENS BOULEVARD BRIDGE - LINE 2 TRACK - REF. 1/S-496

SCALE: 3/64" = 1'-0"



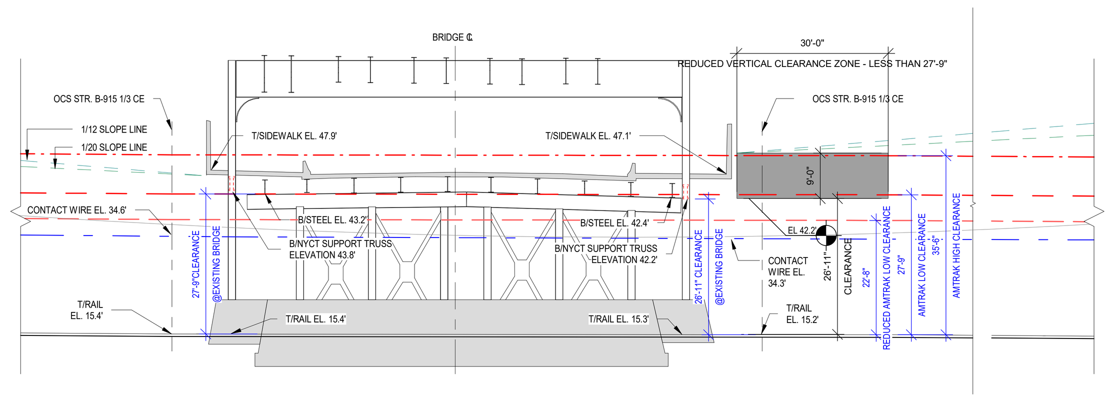
5 SECTION AT QUEENS BOULEVARD BRIDGE - MAINLINE - LI WWD TRACK - REF. 2/S-496

SCALE: 3/64" = 1'-0"



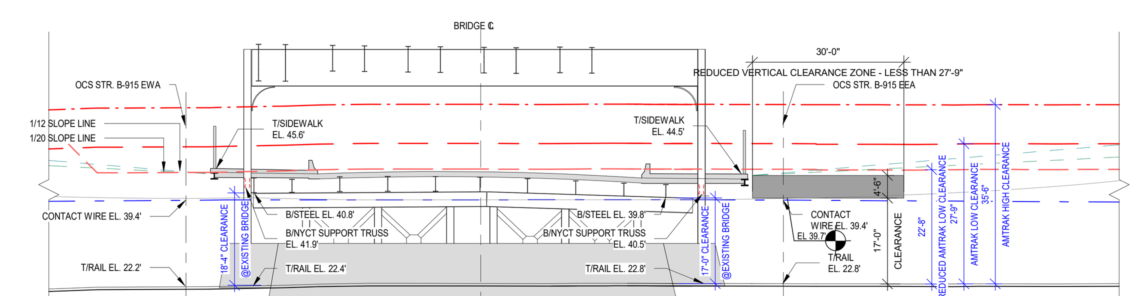
6 SECTION AT QUEENS BOULEVARD BRIDGE - MAINLINE - LINE 3 TRACK - REF. 1/S-497

SCALE: 3/64" = 1'-0"



7 SECTION AT QUEENS BOULEVARD BRIDGE - LOOP - LOOP 2 TRACK - REF. 2/S-497

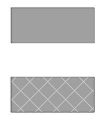
SCALE: 3/64" = 1'-0"



8 SECTION AT QUEENS BOULEVARD BRIDGE - LOOP - LOOP 1 TRACK - REF. 1/S-498

SCALE: 3/64" = 1'-0"

LEGEND



TYPICAL LOADING

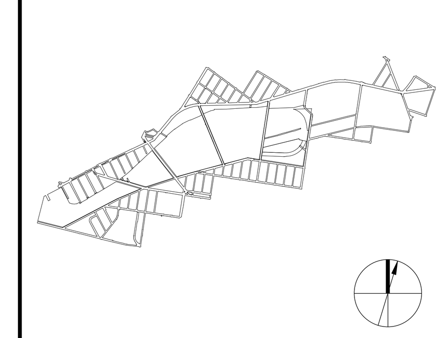
REDUCED LOADING

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



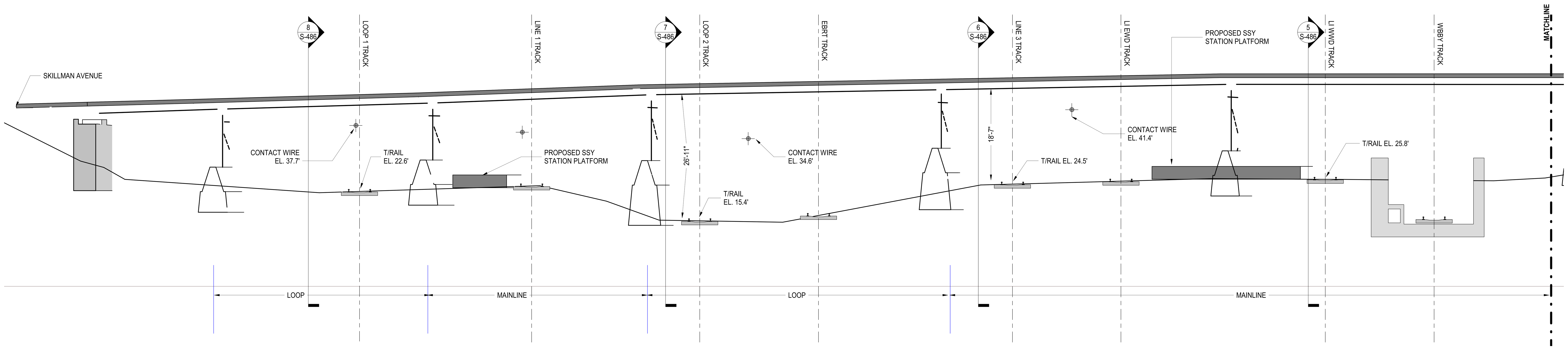
Discipline: STRUCTURE

Title

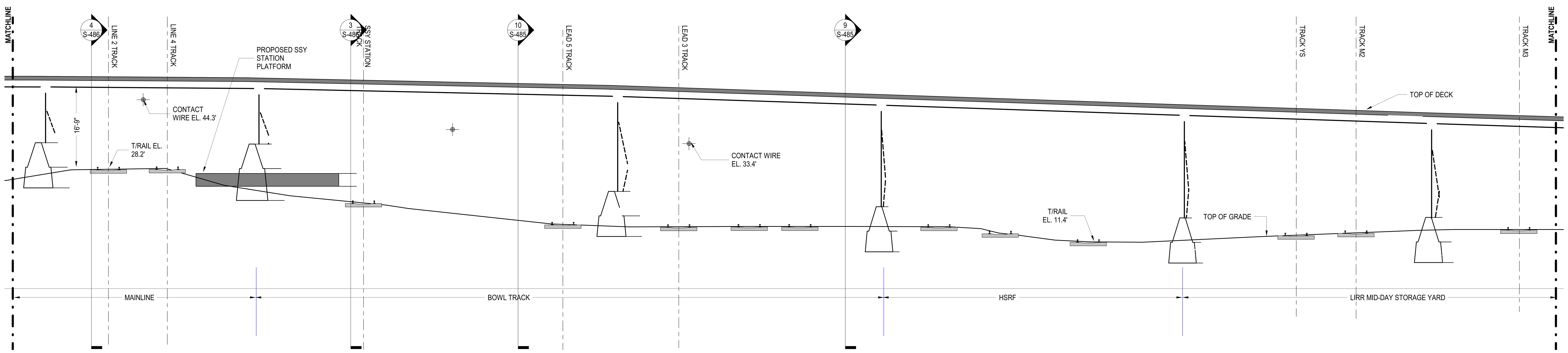
QUEENS BOULEVARD BRIDGE SECTIONS

Thornton Tomasetti

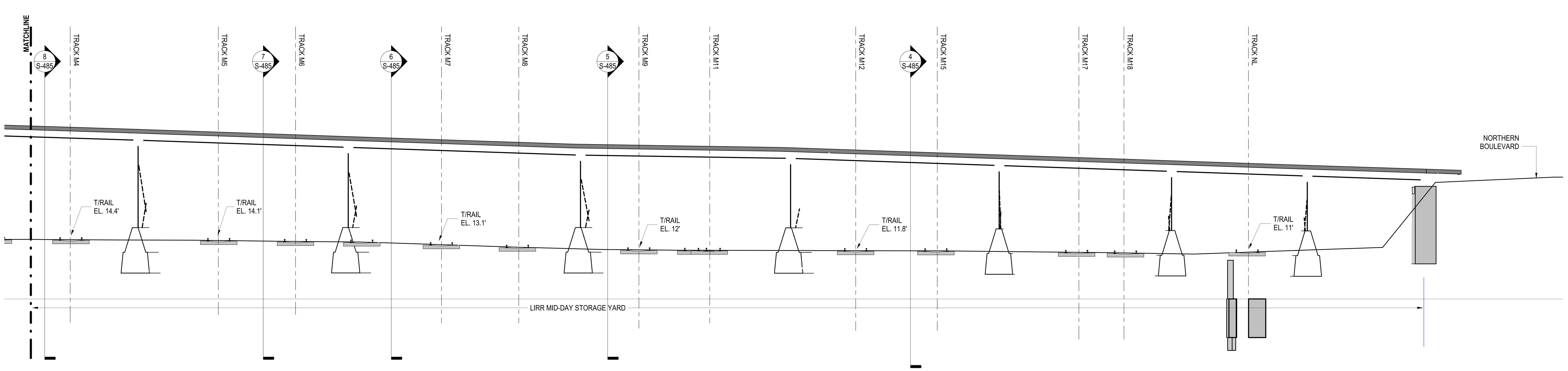
Designed by	Designer
Drawn by	Author
Checked by	Checker
Date	08/12/19
Drawing Number	S-486



1 **ELEVATION OF QUEENS BOULEVARD BRIDGE**
SCALE: 1" = 10'-0"



2 **ELEVATION OF QUEENS BOULEVARD BRIDGE**
SCALE: 1" = 10'-0"



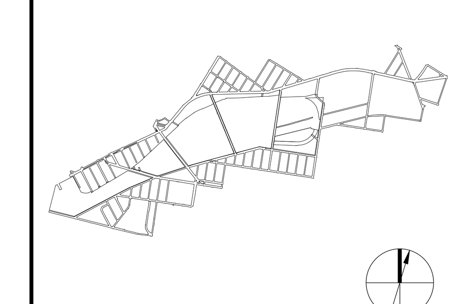
3 **ELEVATION OF QUEENS BOULEVARD BRIDGE**
SCALE: 1" = 10'-0"

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:
STRUCTURE

Title
QUEENS BOULEVARD - LONGITUDINAL BRIDGE SECTION

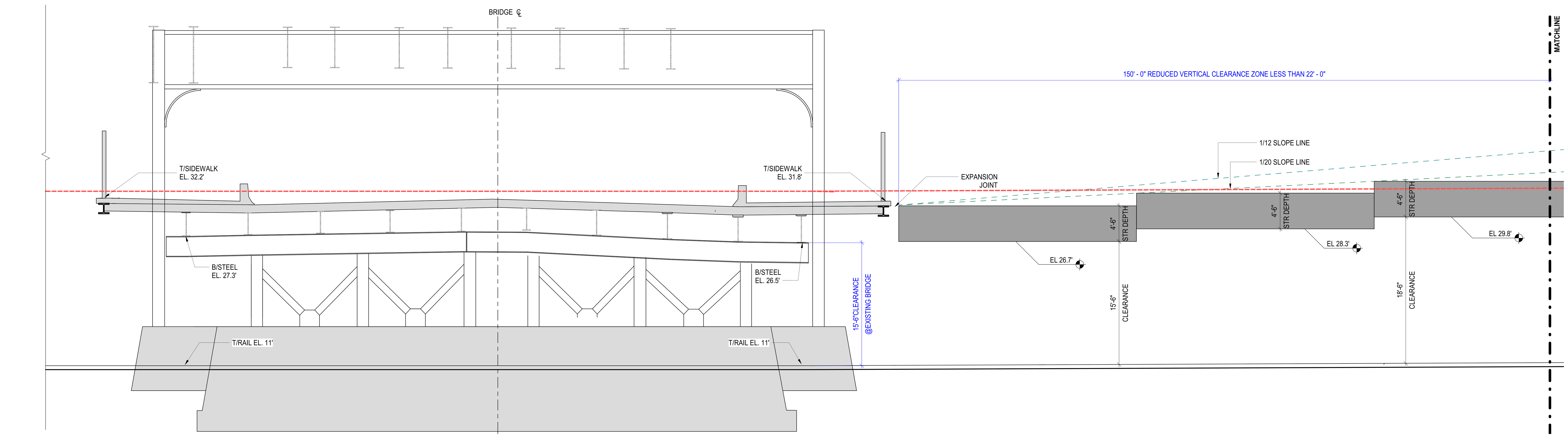
Thornton Tomasetti

Designed by	Designer
Drawn by	Author
Checked by	Checker
Date	09/12/19
Drawing Number	S-487

LEGEND

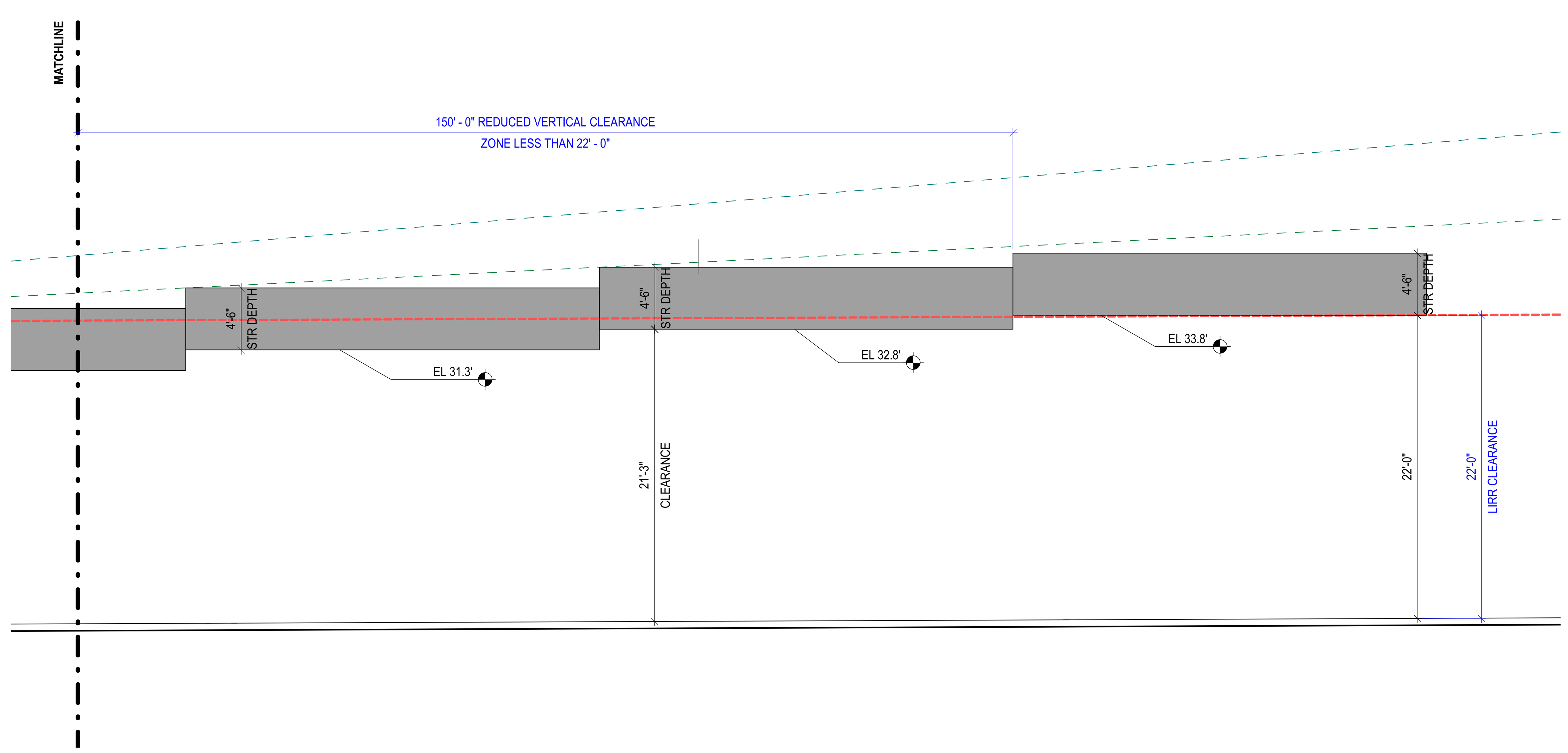
TYPICAL LOADING

REDUCED LOADING



1 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK NL (1)

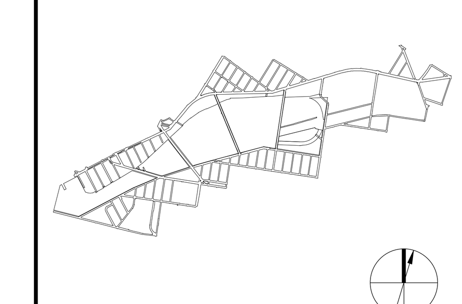
SCALE: 3/16" = 1'-0"



2 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK NL (2)

SCALE: 3/16" = 1'-0"

NYCEDC



STRUCTURE

QUEENS BOULEVARD
BRIDGE SECTIONS

Thornton Tomasetti

Designer

Author

Checker

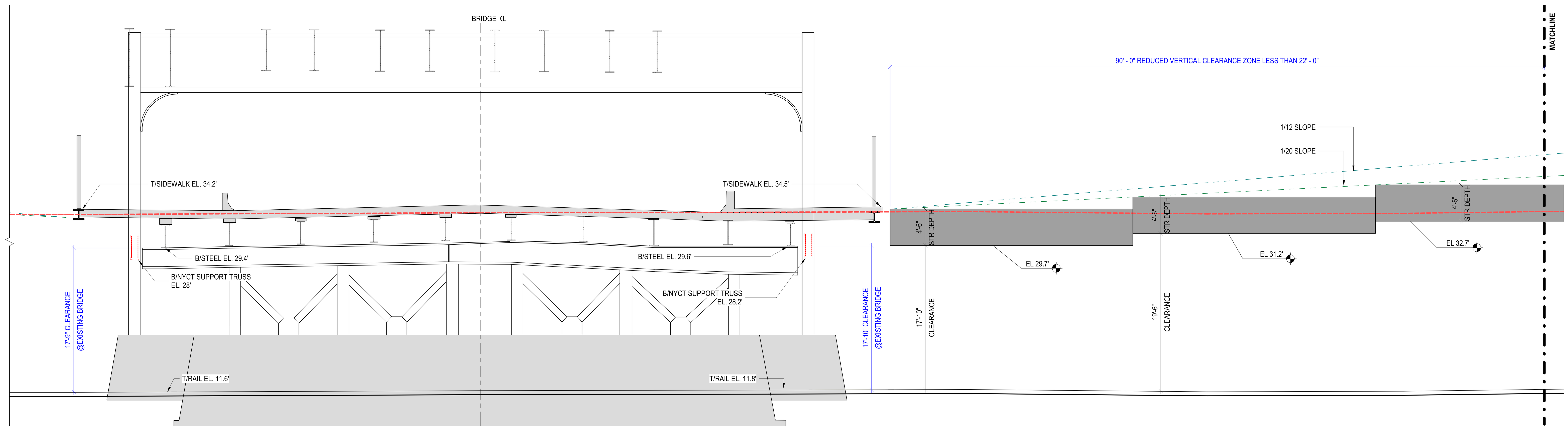
08/30/19

S-488

LEGEND

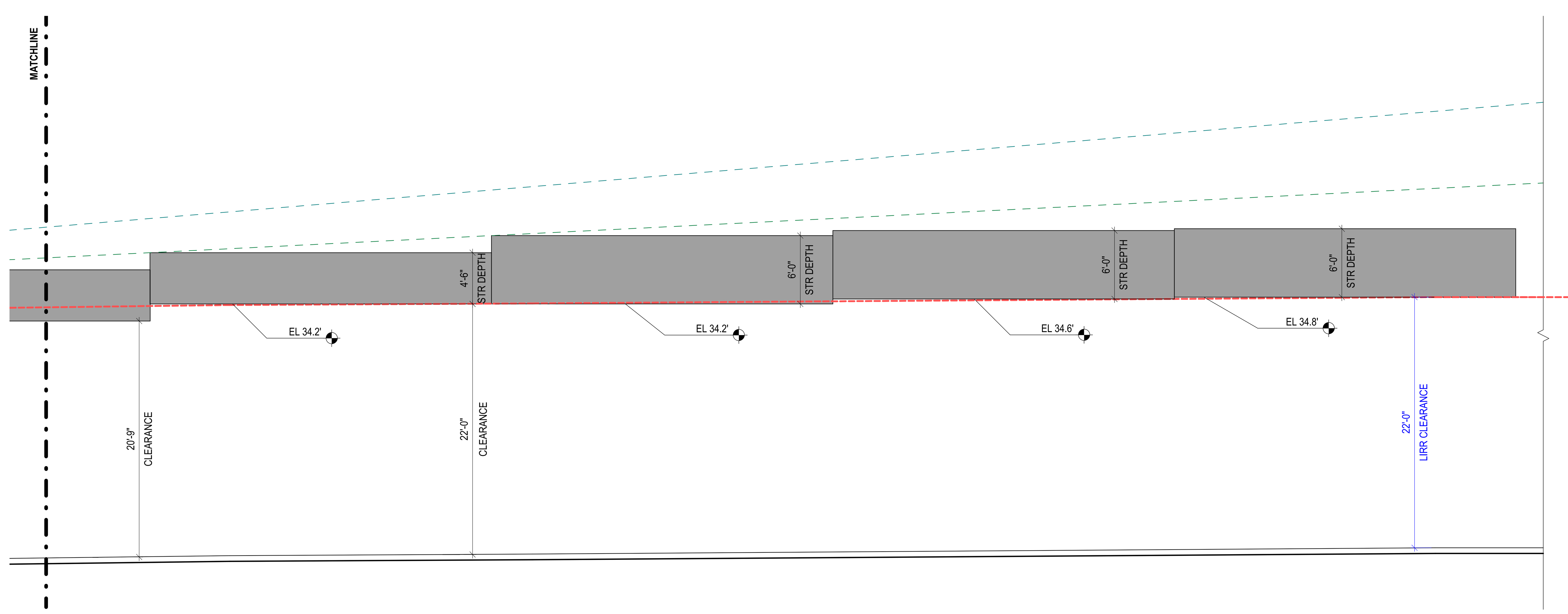
TYPICAL LOADING

REDUCED LOADING



1 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M12 (1)

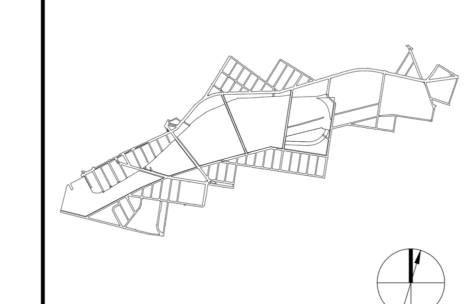
SCALE: 3/16" = 1'-0"



2 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M12 (2)

SCALE: 3/16" = 1'-0"

NYCEDC



STRUCTURE

QUEENS BOULEVARD BRIDGE SECTIONS

Thornton Tomasetti

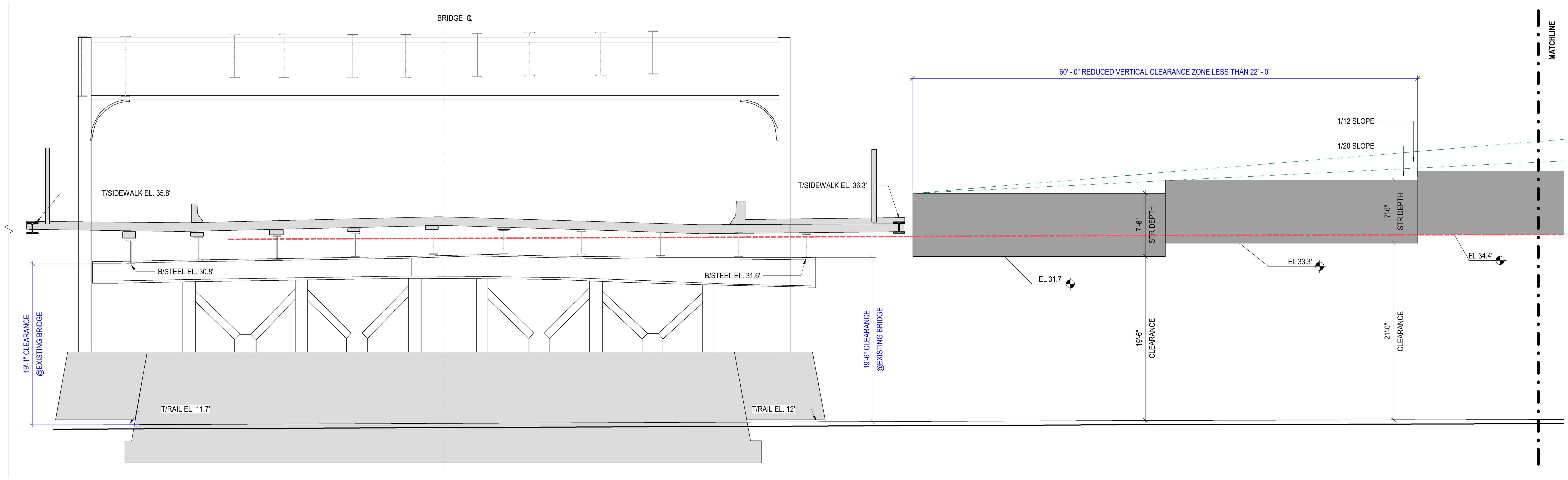
Designer

Author

Checker

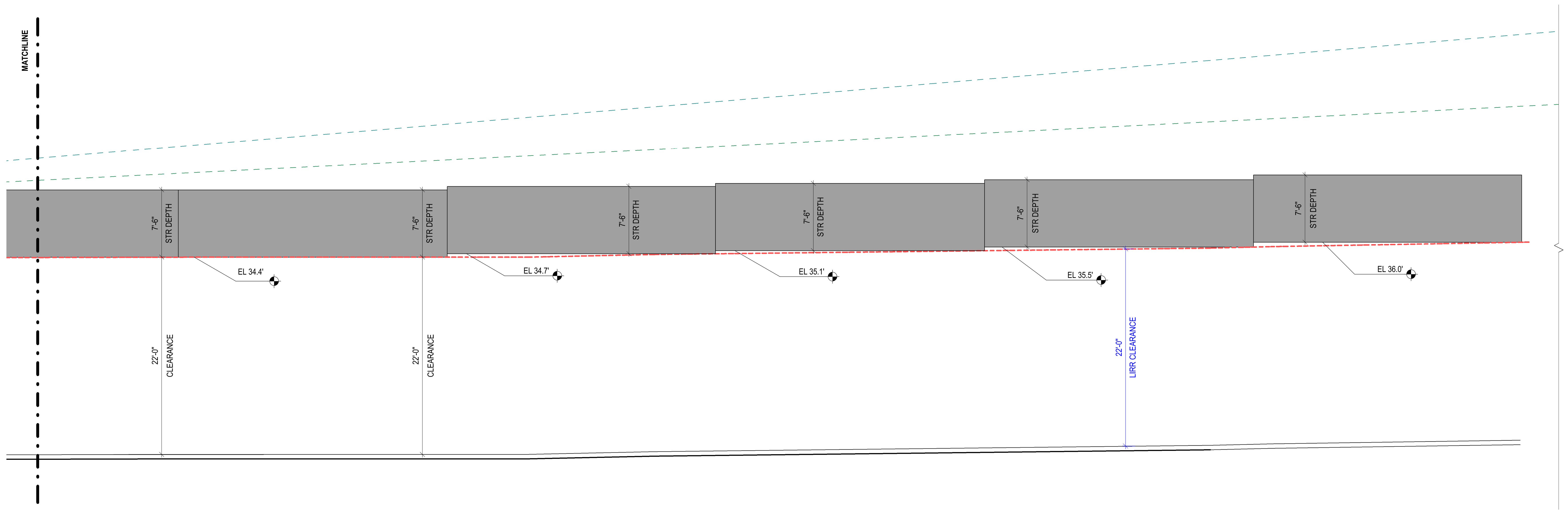
09/04/19

S-489



1 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M9 (1)

SCALE: 3/16" = 1'-0"



2 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M9 (2)

SCALE: 3/16" = 1'-0"

LEGEND

TYPICAL LOADING

REDUCED LOADING

NYCEDC

STRUCTURE

QUEENS BOULEVARD BRIDGE SECTIONS

Thornton Tomasetti

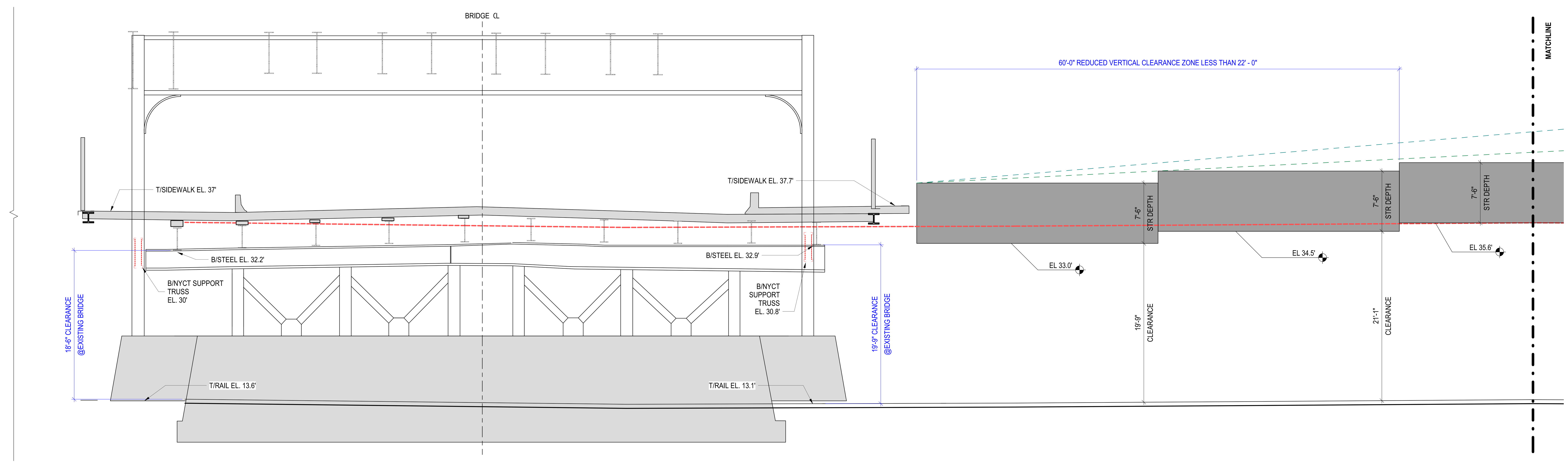
Designer

Author

Checker

09/04/19

S-490



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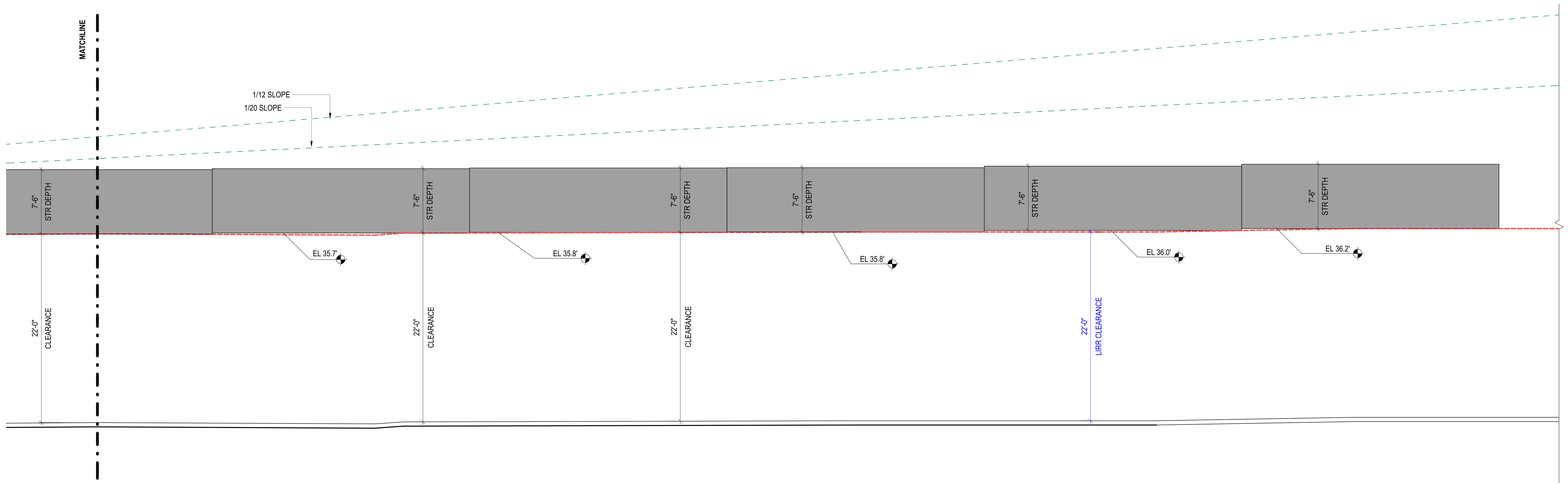
SCALE: 3/16" = 1'-0"



2 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M7 (2)

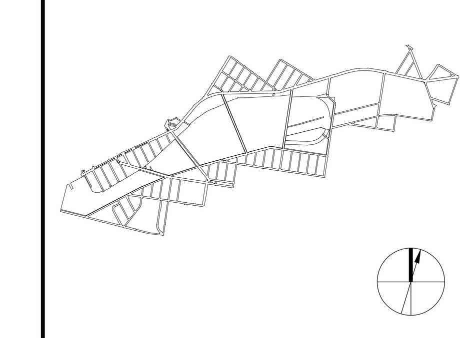
SCALE: 3/16" = 1'-0"

LEGEND

TYPICAL LOADING

REDUCED LOADING

NYCEDC



STRUCTURE

QUEENS BOULEVARD BRIDGE SECTIONS

Thornton Tomasetti

Designer

Author

Checker

08/30/19

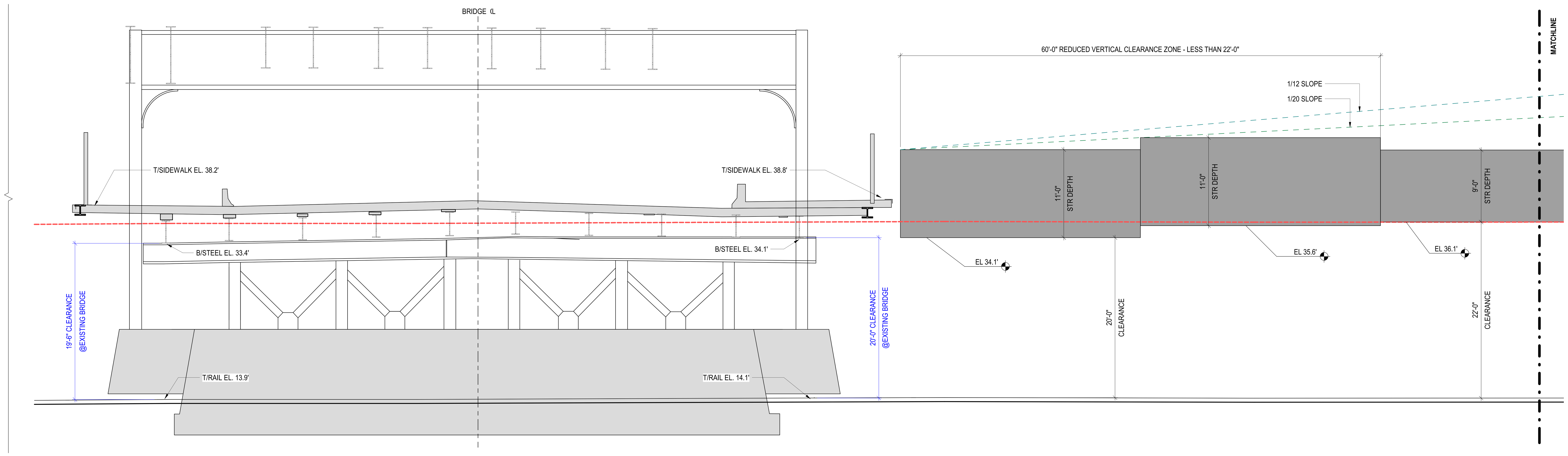
S-491

LEGEND

TYPICAL LOADING

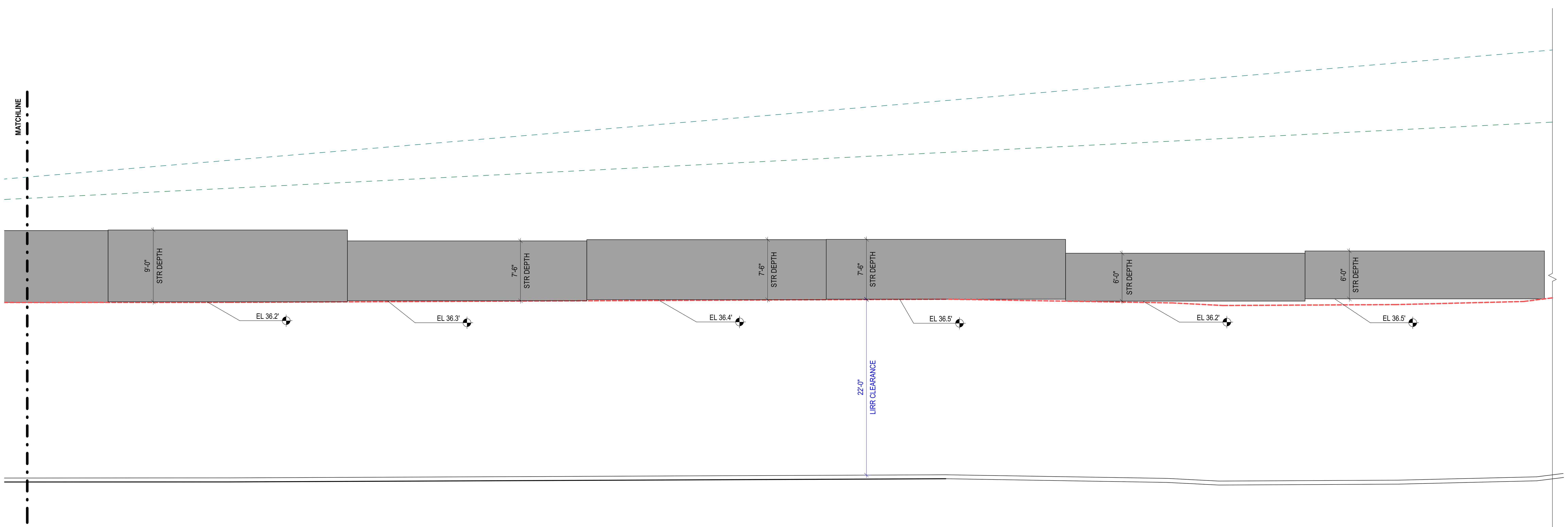
REDUCED LOADING

NYCEDC



1 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M6 (1)

SCALE: 3/16" = 1'-0"



2 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M6 (2)

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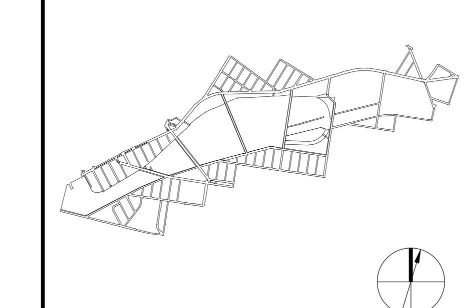


STRUCTURE

QUEENS BOULEVARD
BRIDGE SECTIONS

Thornton Tomasetti

Designer
Author
Checker
09/04/19

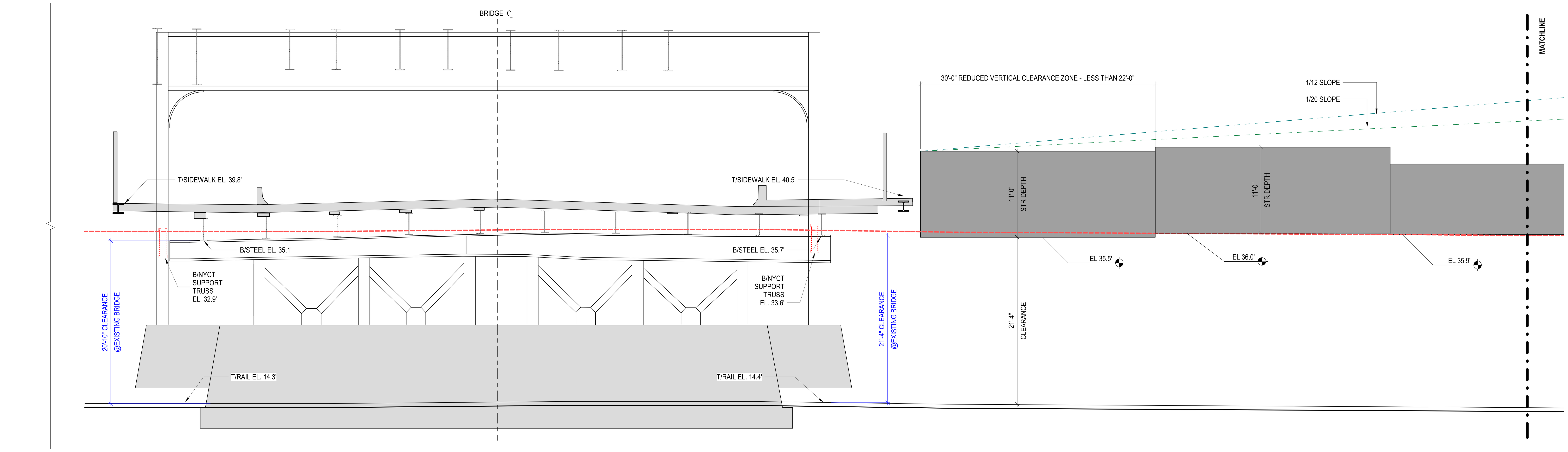
S-492

LEGEND

TYPICAL LOADING

REDUCED LOADING

NYCEDC



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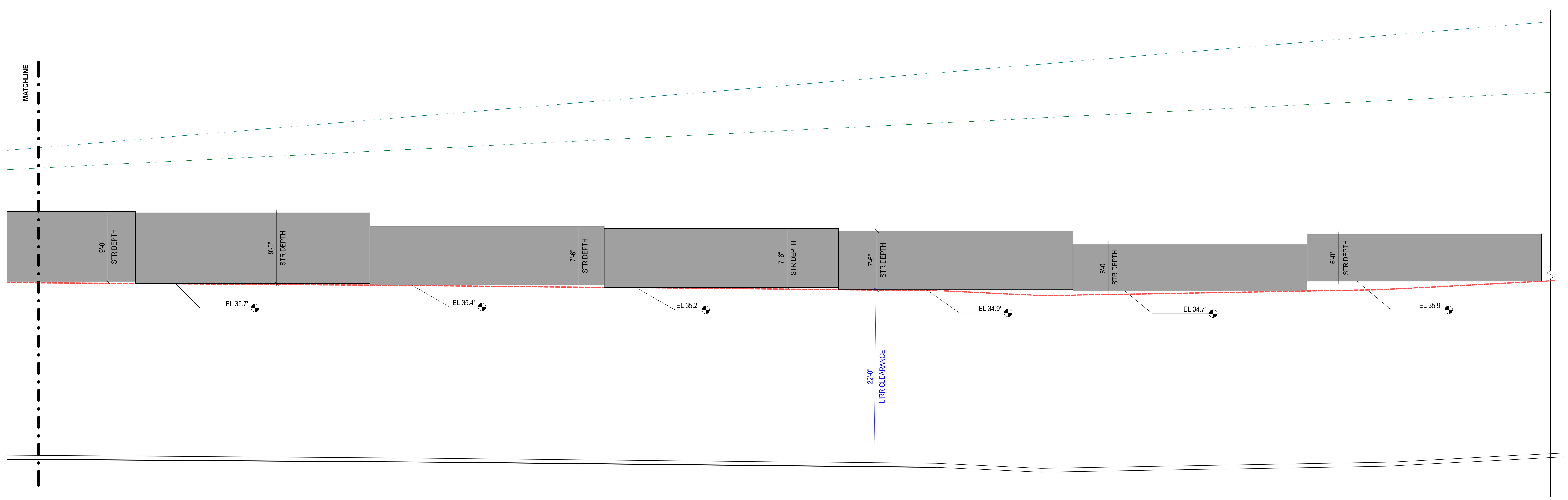

2 SECTION AT QUEENS BOULEVARD BRIDGE - TRACK M4 (2)

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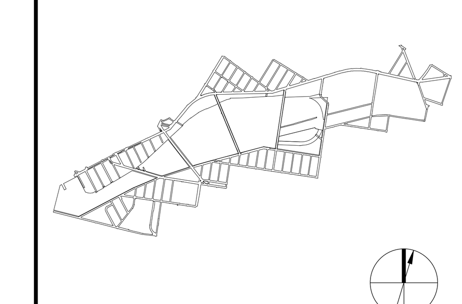


STRUCTURE

QUEENS BOULEVARD BRIDGE SECTIONS

Thornton Tomasetti

Designer

Author

Checker

09/04/19

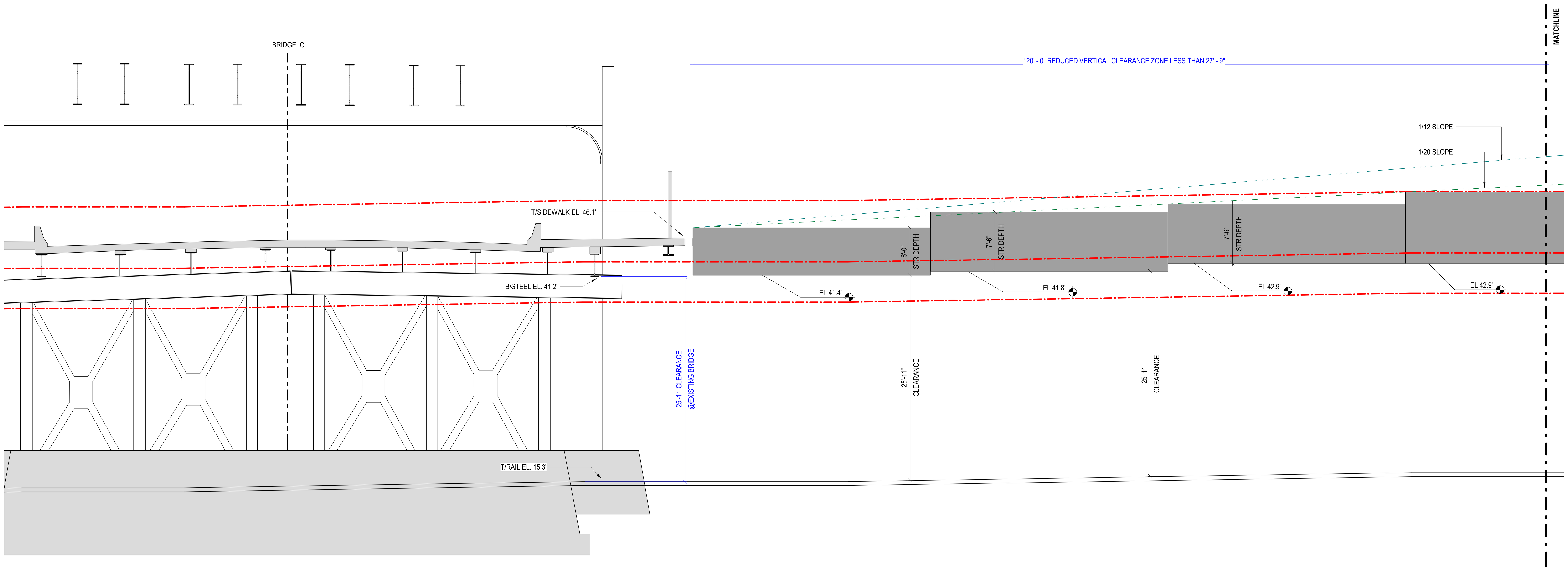
S-493

LEGEND

TYPICAL LOADING

REDUCED LOADING

NYCEDC



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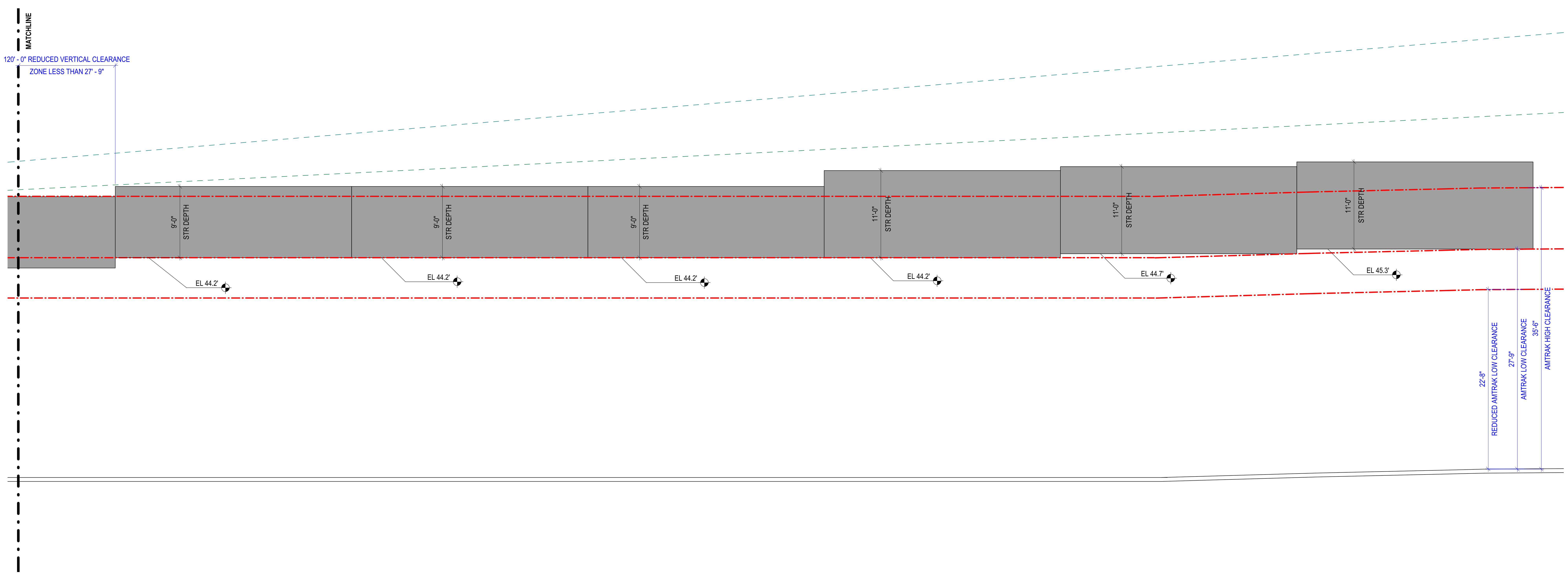
SCALE: 3/16" = 1'-0"



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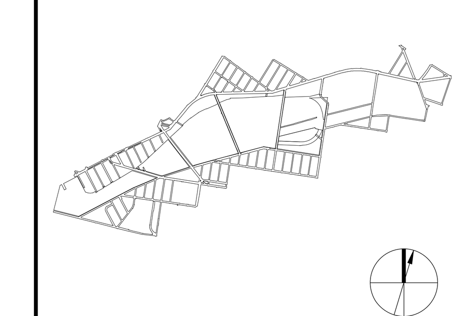


STRUCTURE

QUEENS BOULEVARD BRIDGE SECTIONS

Thornton Tomasetti

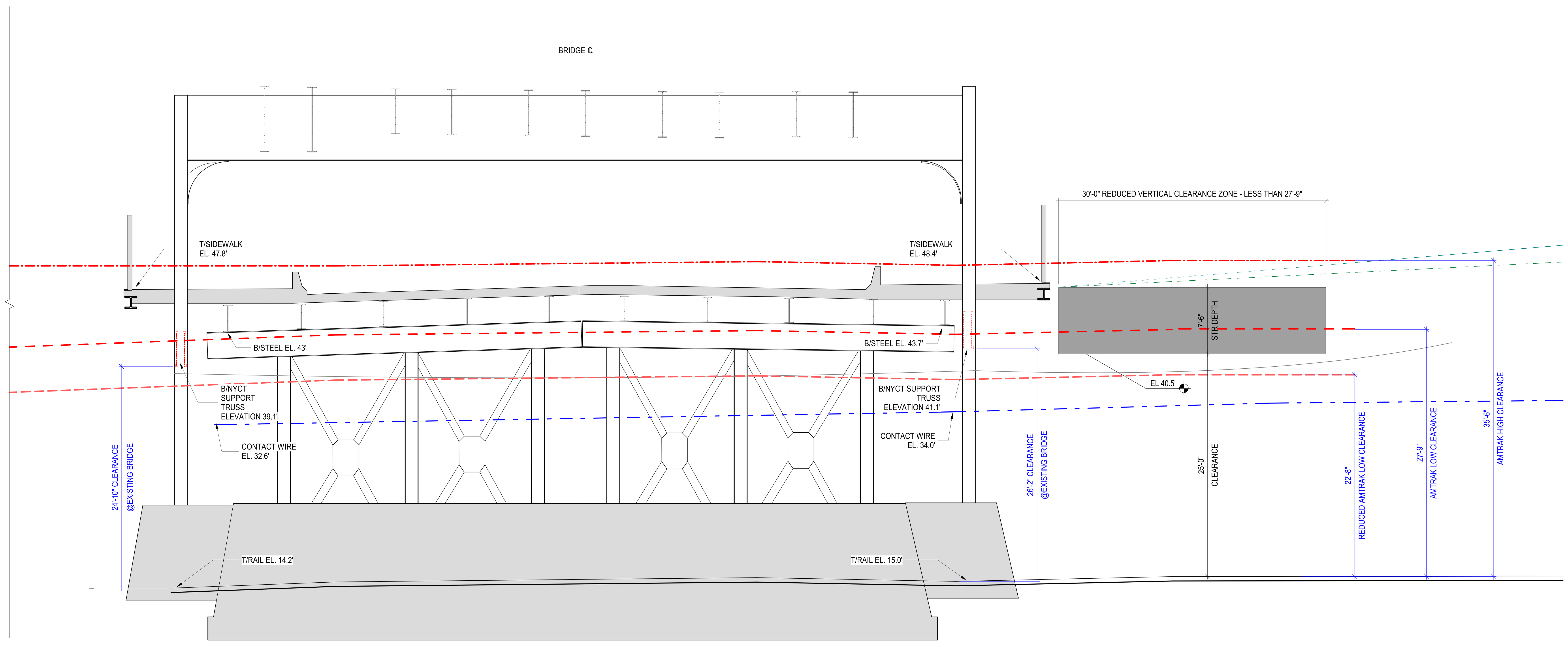
Designer

Author

Checker

08/30/19

S-494



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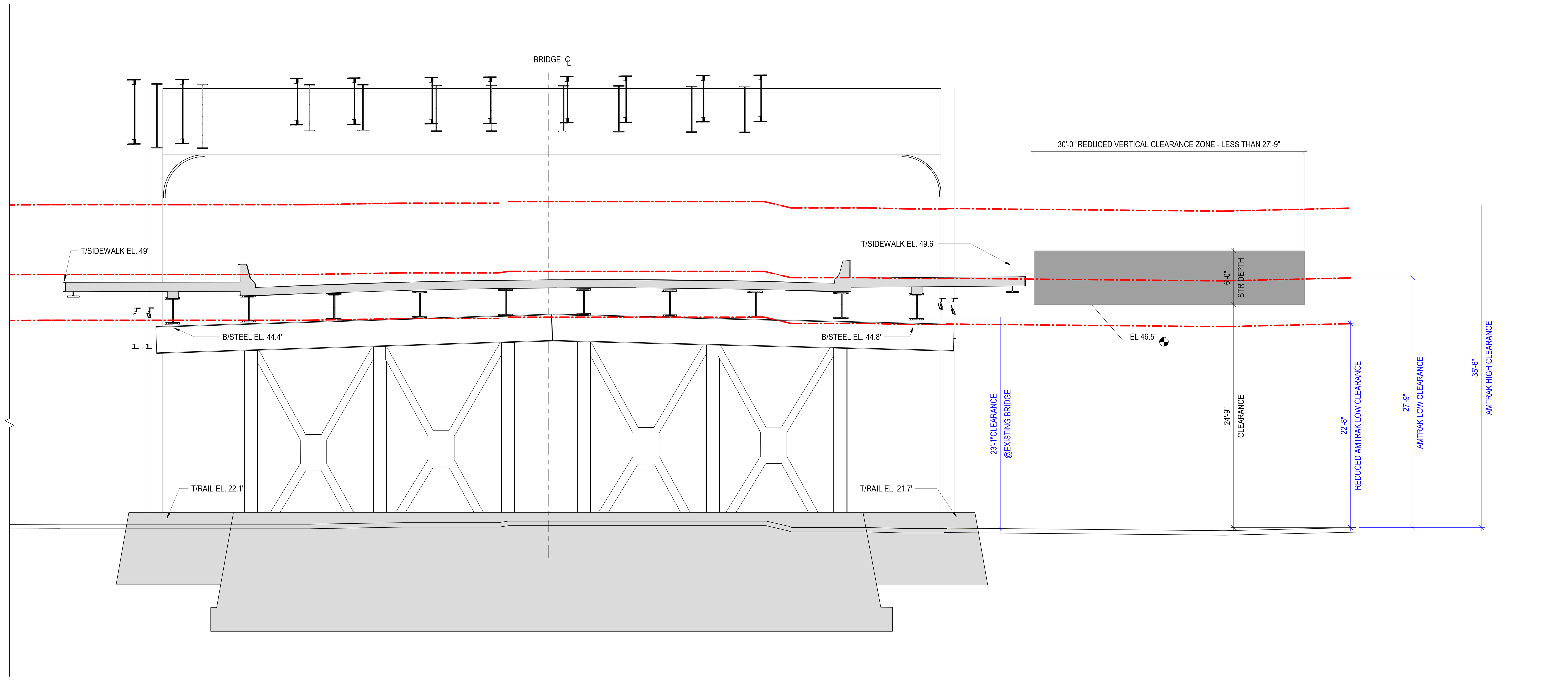
SCALE: 3/16" = 1'-0"



2 SECTION AT QUEENS BOULEVARD BRIDGE - PROPOSED TRACK FOR SSY

SCALE: 3/16" = 1'-0"

LEGEND

- TYPICAL LOADING
- REDUCED LOADING

NYCEDC

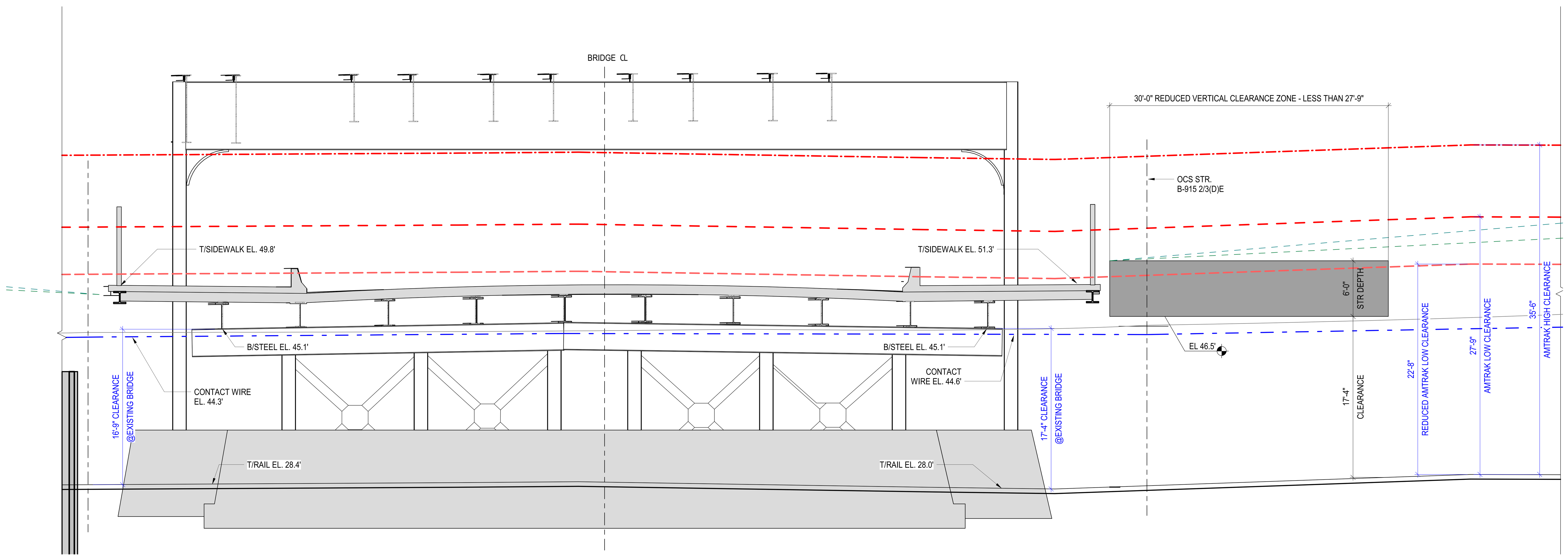
STRUCTURE

QUEENS BOULEVARD BRIDGE SECTIONS

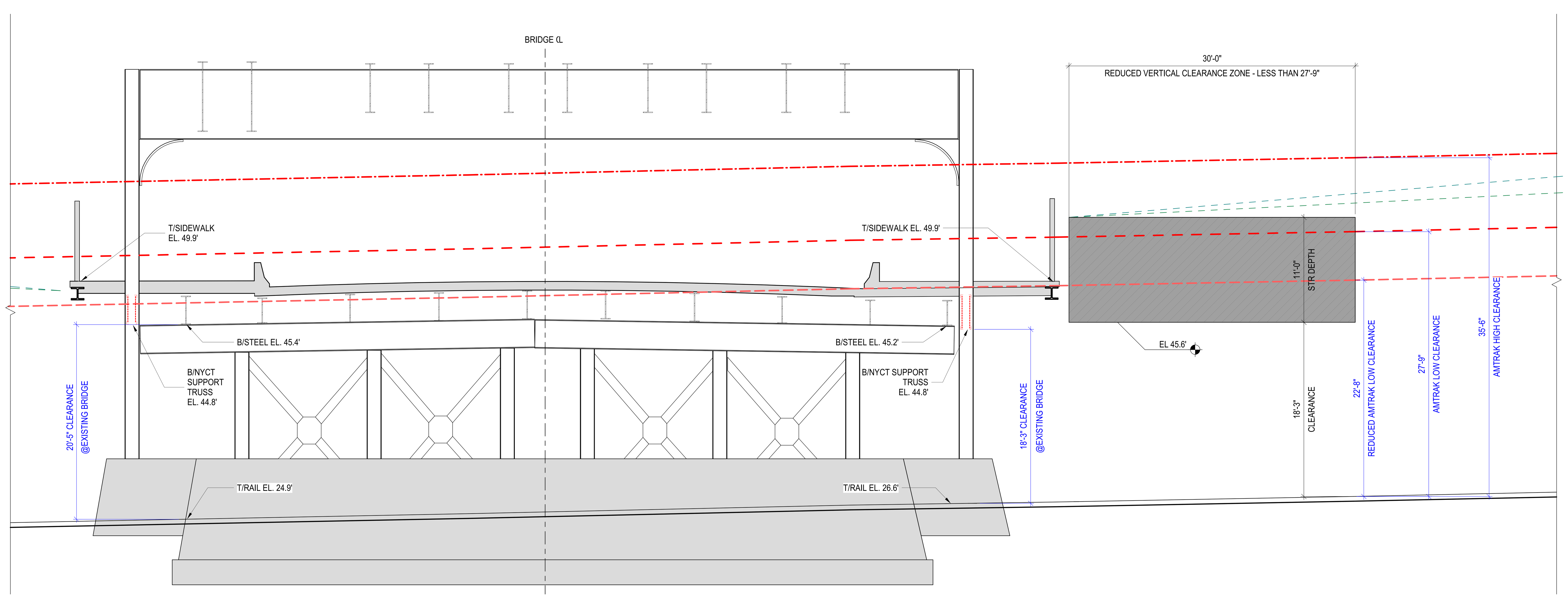
Thornton Tomasetti

Designer
Author
Checker
09/04/19

S-495



1 **SECTION AT QUEENS BOULEVARD BRIDGE - PRIMER PHASE**
SCALE: 3/16" = 1'-0"



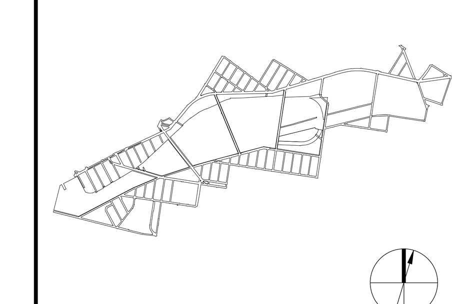
2 **SECTION AT QUEENS BOULEVARD BRIDGE - MAINLINE - LI WWD TRACK**
SCALE: 3/16" = 1'-0"

LEGEND

TYPICAL LOADING

REDUCED LOADING

NYCEDC



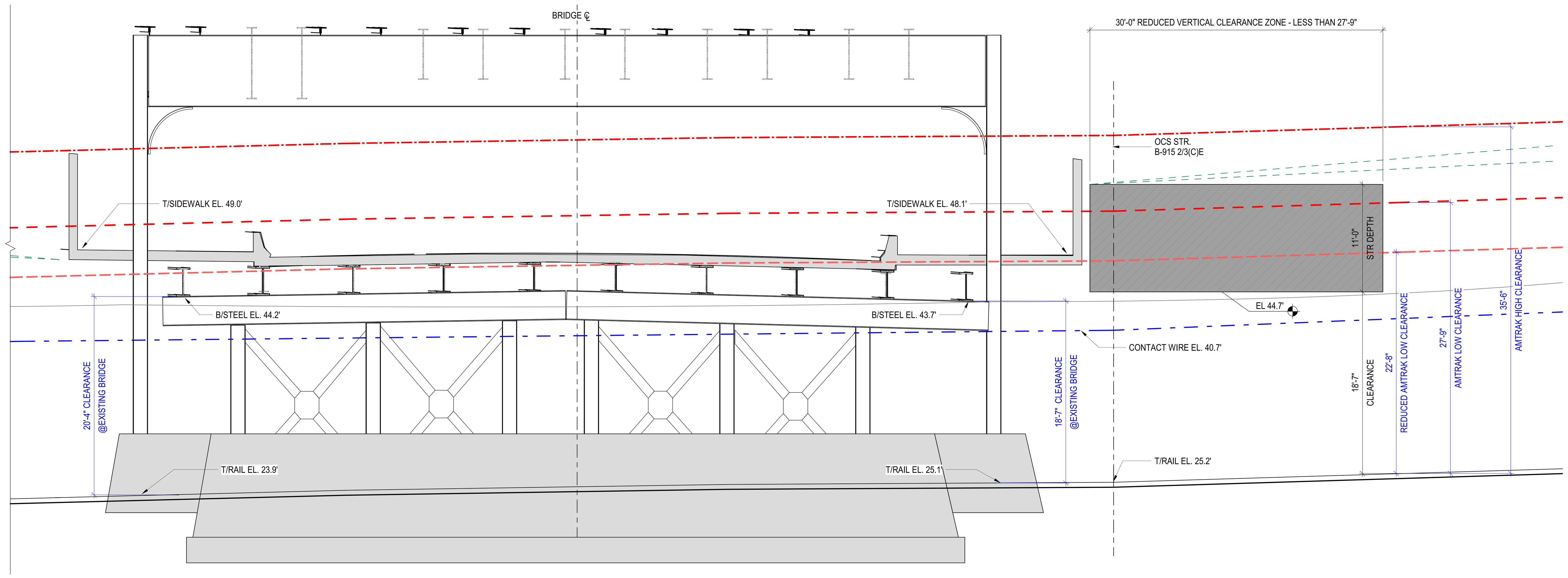
STRUCTURE

QUEENS BOULEVARD
BRIDGE SECTIONS

Thornton Tomasetti

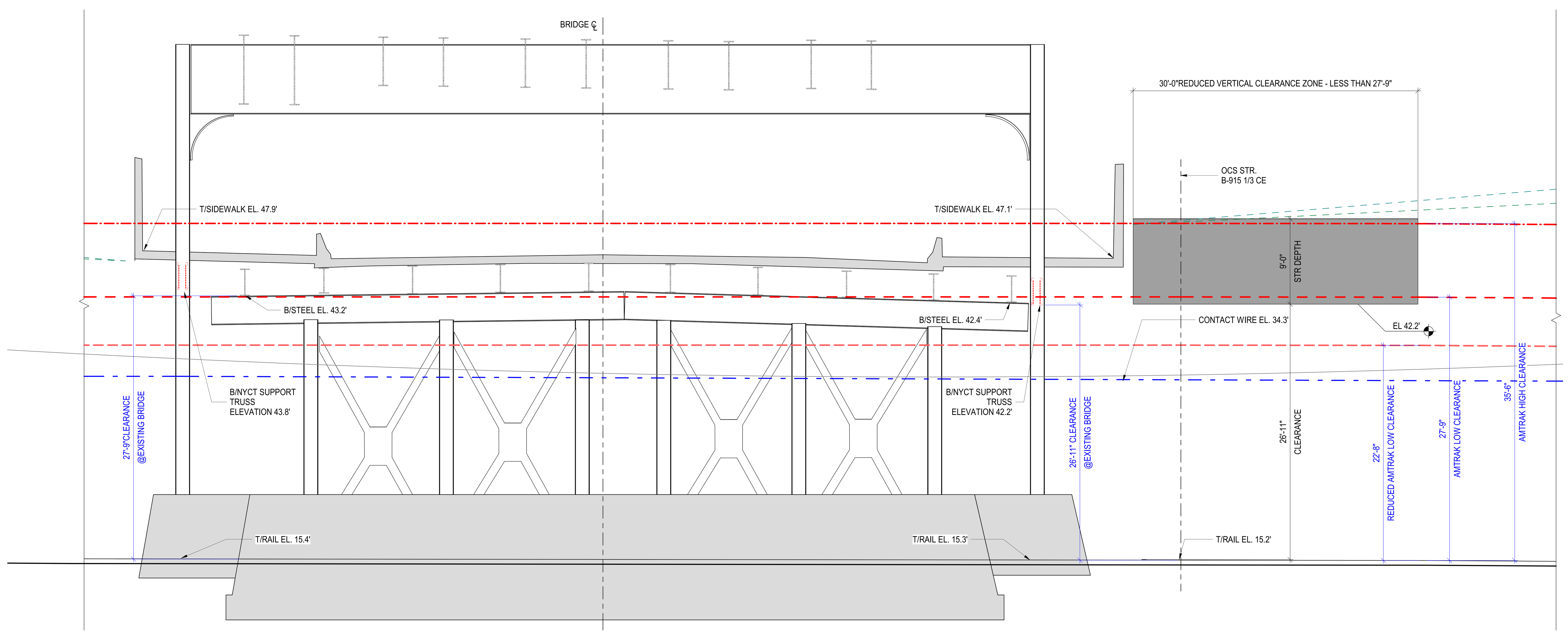
Designer
Author
Checker
08/30/19

S-496



1 **SECTION AT QUEENS BOULEVARD BRIDGE - MAINLINE - LINE 3 TRACK**

SCALE: 3/16" = 1'-0"



2 **SECTION AT QUEENS BOULEVARD BRIDGE - LOOP - LOOP 2 TRACK**

SCALE: 3/16" = 1'-0"

LEGEND

TYPICAL LOADING

REDUCED LOADING

NYCEDC

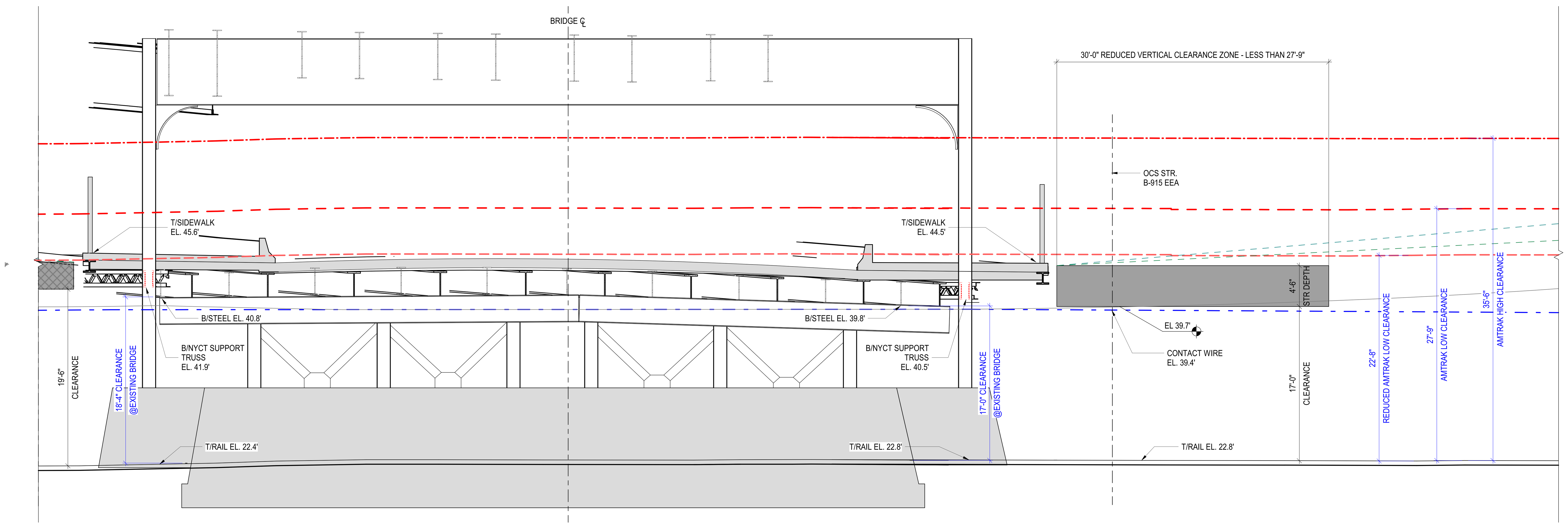
STRUCTURE

QUEENS BOULEVARD
BRIDGE SECTIONS

Thornton Tomasetti

Designer
Author
Checker
08/30/19

S-497



1 **SECTION AT QUEENS BOULEVARD BRIDGE - LOOP - LOOP 1 TRACK**

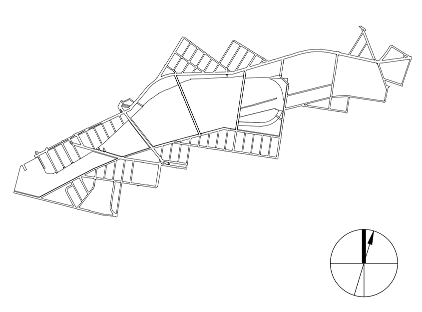
SCALE: 3/16" = 1'-0"

LEGEND

TYPICAL LOADING

REDUCED LOADING

NYCEDC



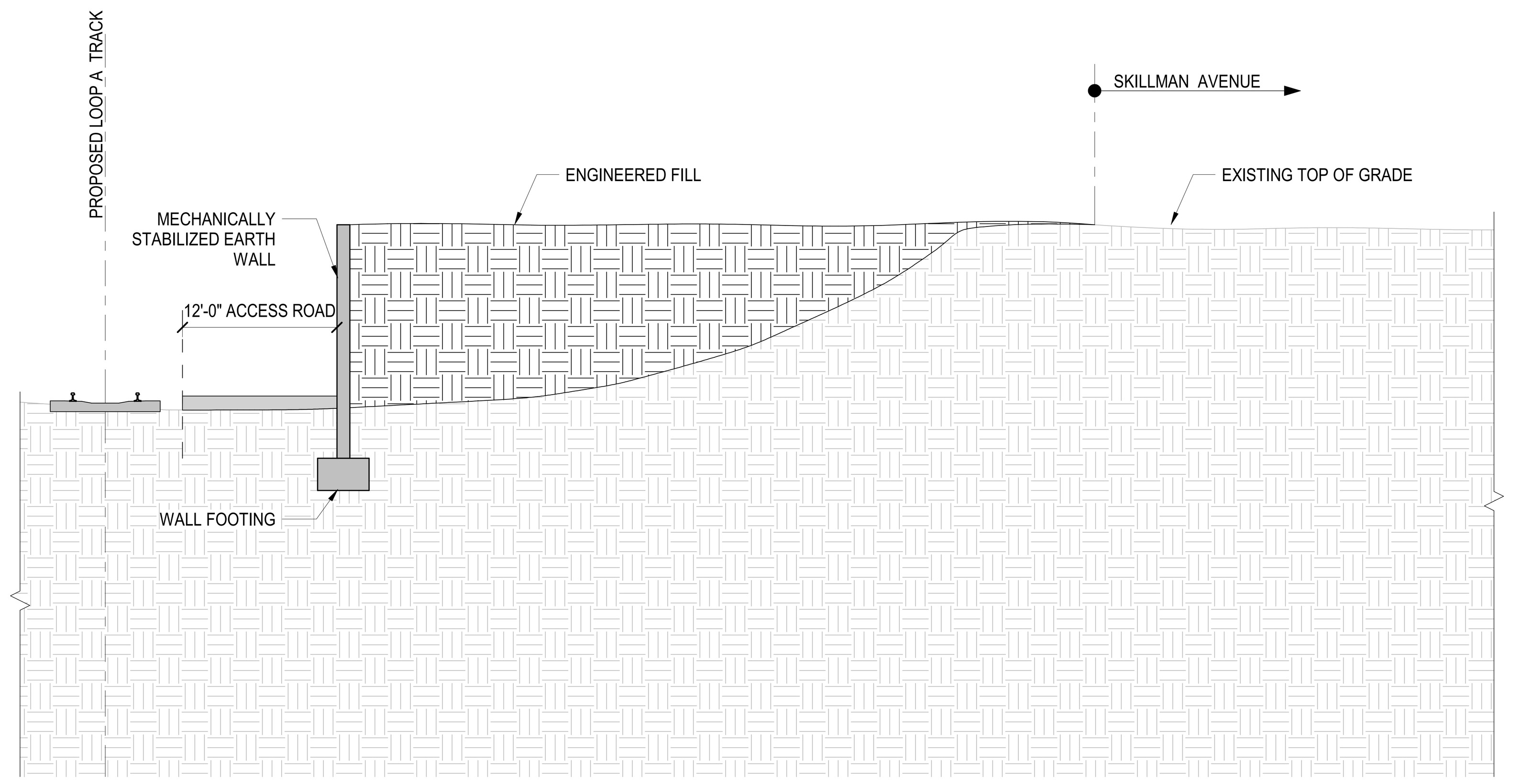
STRUCTURE

QUEENS BOULEVARD
BRIDGE SECTIONS

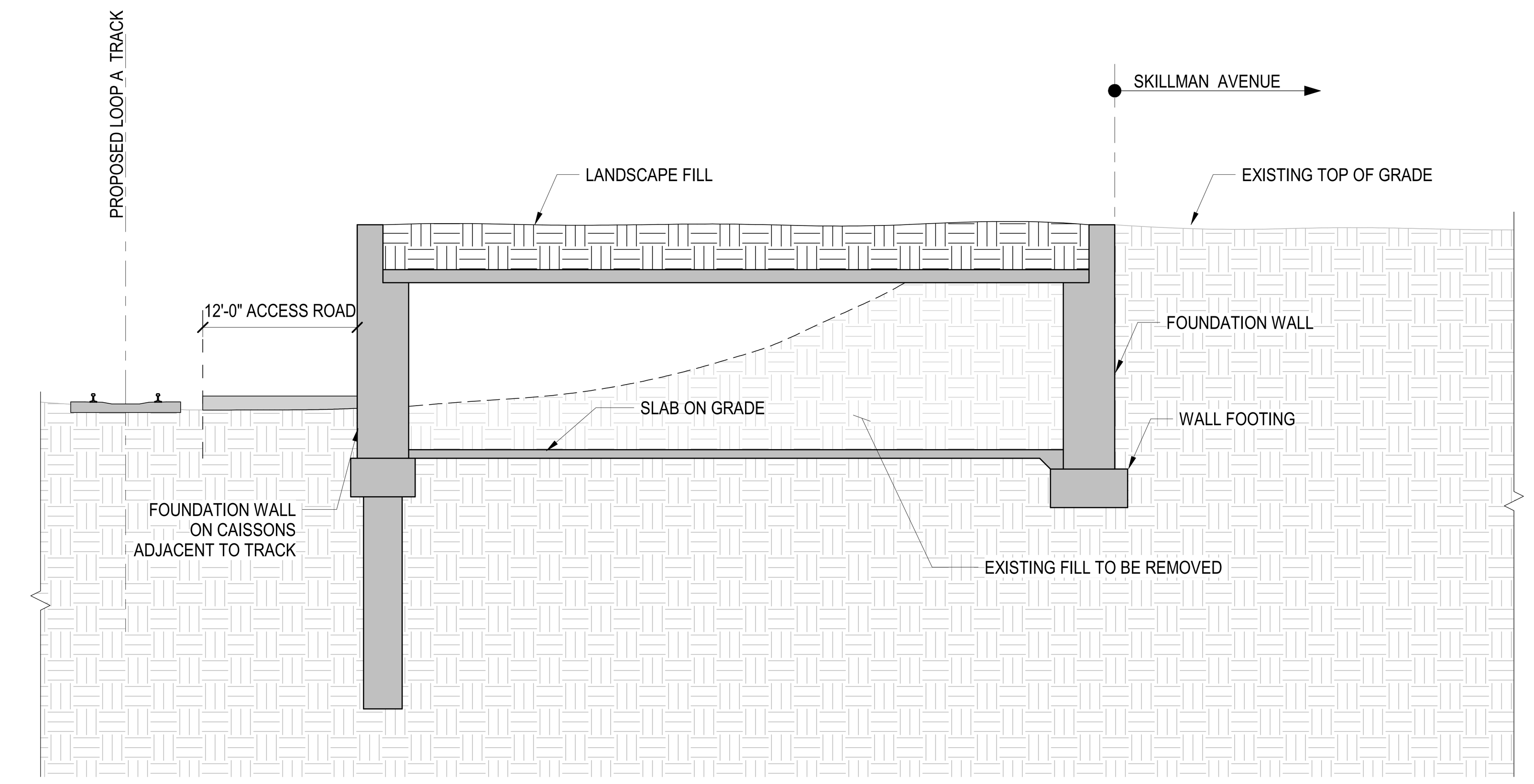
Thornton Tomasetti

Designer
Author
Checker
09/04/19

S-498



1 SECTION AT SKILLMAN
SCALE: 1/8" = 1'-0"



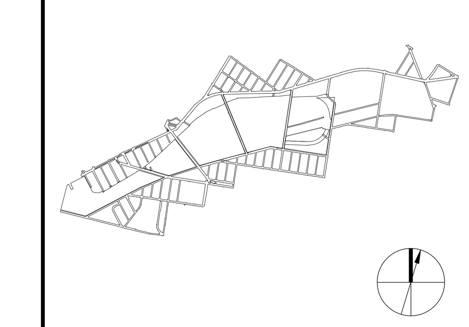
2 SECTION AT SKILLMAN - ALTERNATE OPTION TO ALLOW FOR OCCUPIED CELLAR LEVEL
SCALE: 1/8" = 1'-0"

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan

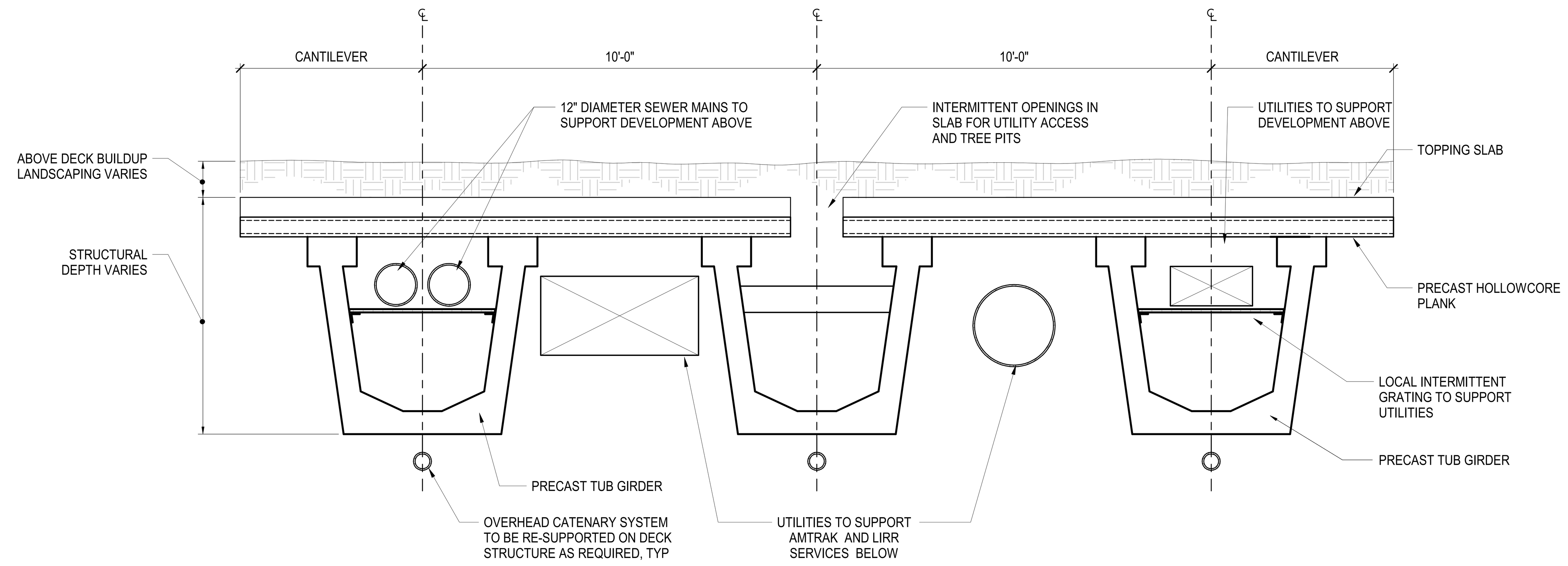


Discipline:
STRUCTURE

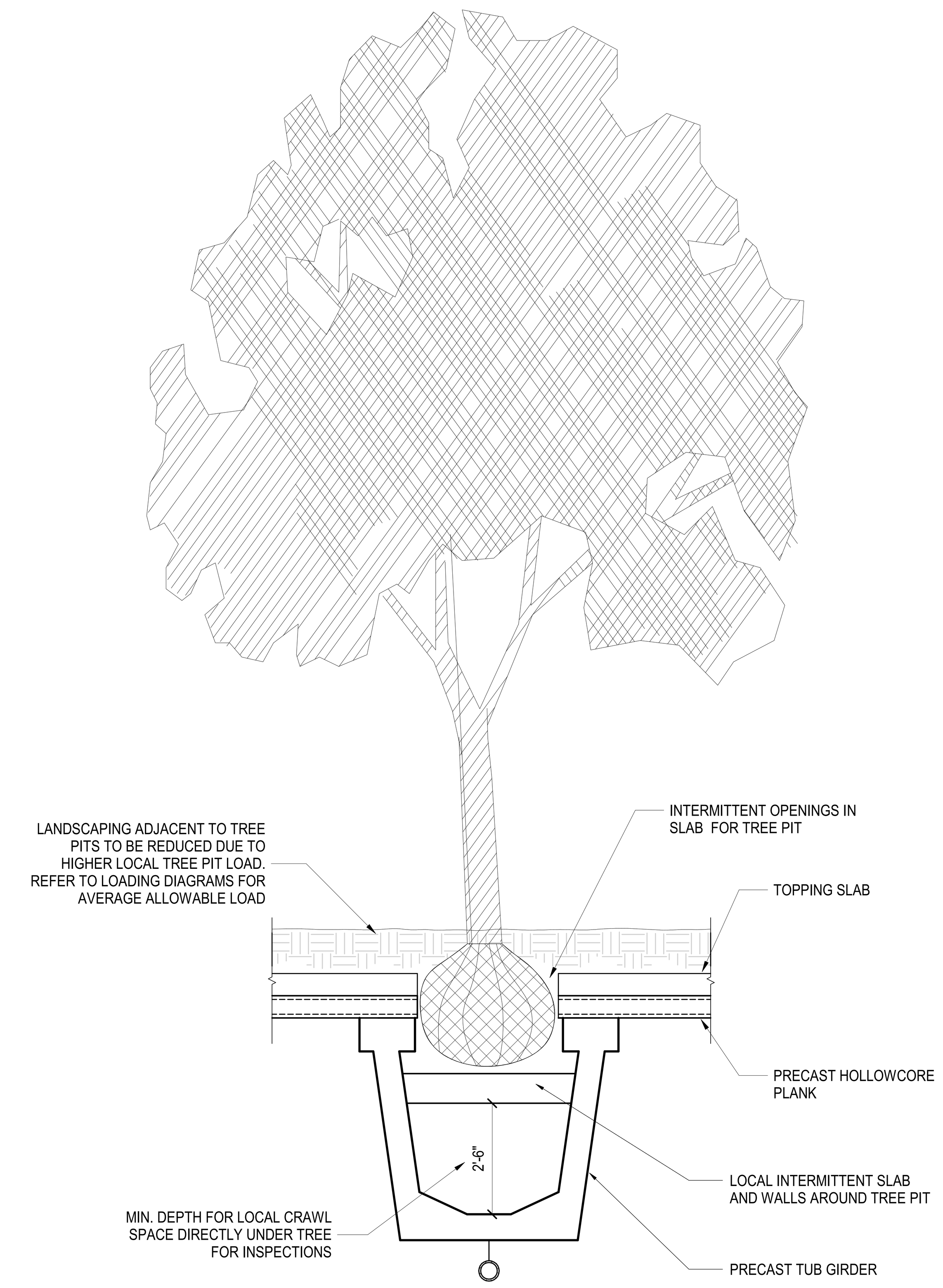
Title
SECTIONS ALONG SKILLMAN AVENUE

Thornton Tomasetti

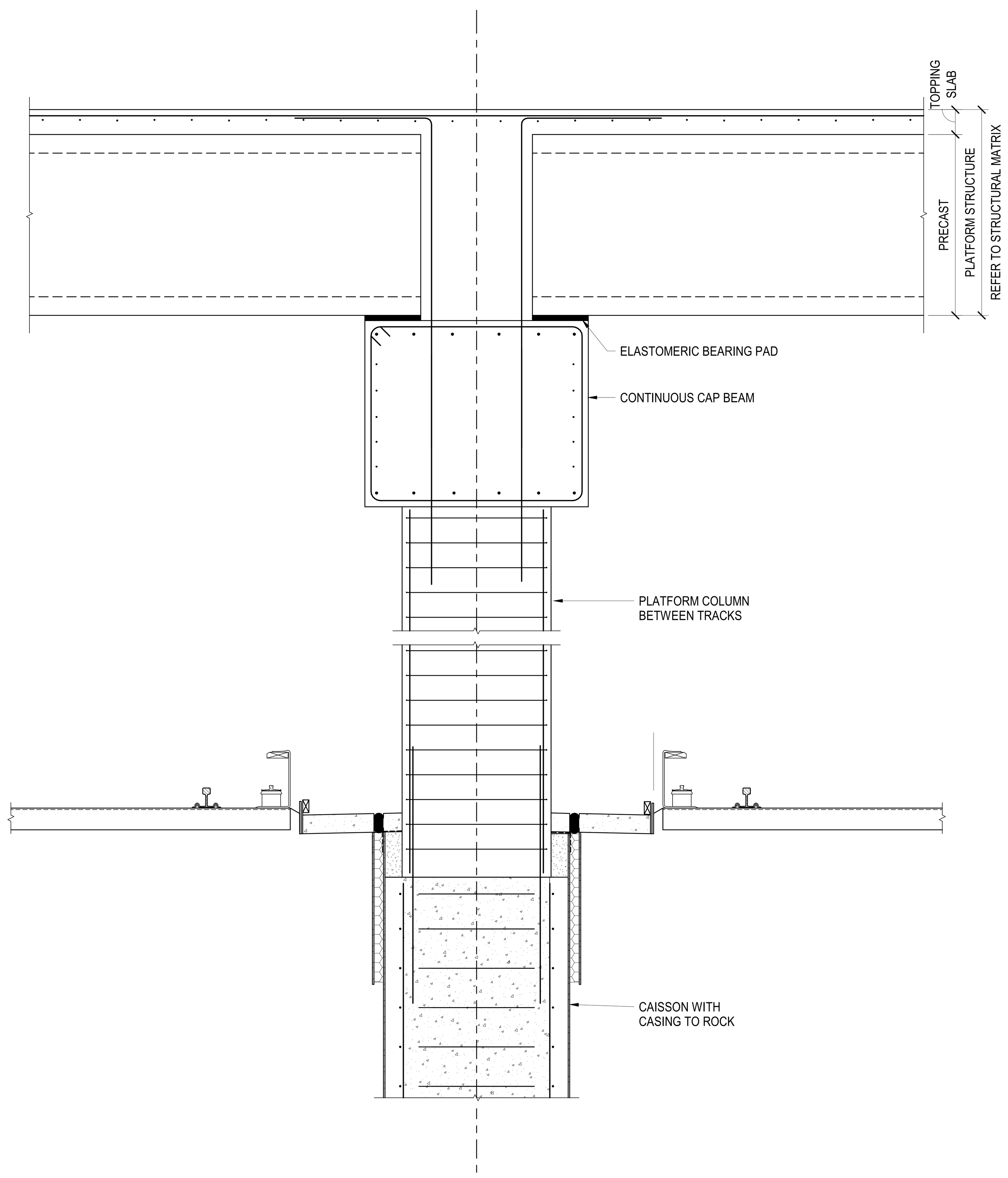
Designed by	Designer
Drawn by	Author
Checked by	Checker
Date	08/14/19
Drawing Number	S-499



1 **TYPICAL SECTION AT TUB GIRDERS**
SCALE: 1/2" = 1'-0"



2 **TYPICAL SECTION AT TREE PITS**
SCALE: 1/2" = 1'-0"



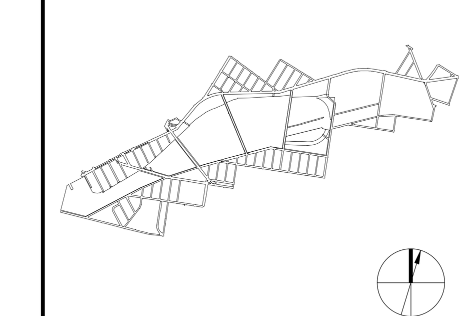
3 **CAP BEAM DETAIL**
SCALE: 1/2" = 1'-0"

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:
STRUCTURE

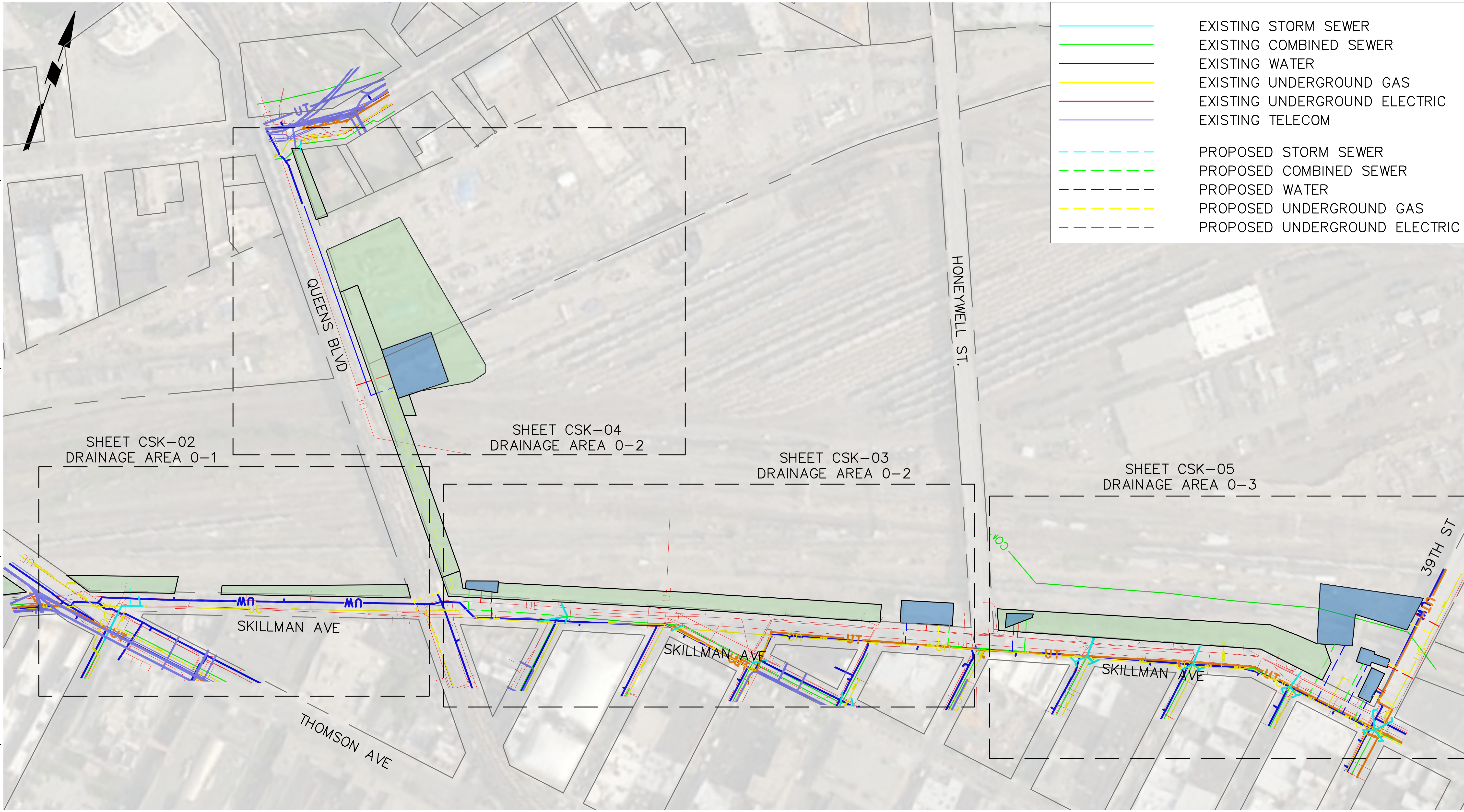
Title
PRIMER PHASE - DECK DETAILS

Thornton Tomasetti

Designed by	CCG/DPO
Drawn by	AP
Checked by	JB
Date	09/06/2019
Drawing Number	S-520

APPENDIX A.7.H

CONCEPT UTILITY PLAN



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250 0 125 250
SCALE: 1 INCH = 250 FEET

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Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Project	Drawing Title	Project No.	Drawing No.
SUNNYSIDE YARD MASTER PLAN	DRAINAGE AREA PHASE 0 KEY MAP	170522401	CSK-01
QUEENS SUNNYSIDE NEW YORK		Date 09/05/2019	
		Drawn By RND	
		Checked By LB	Sheet 1 of 5

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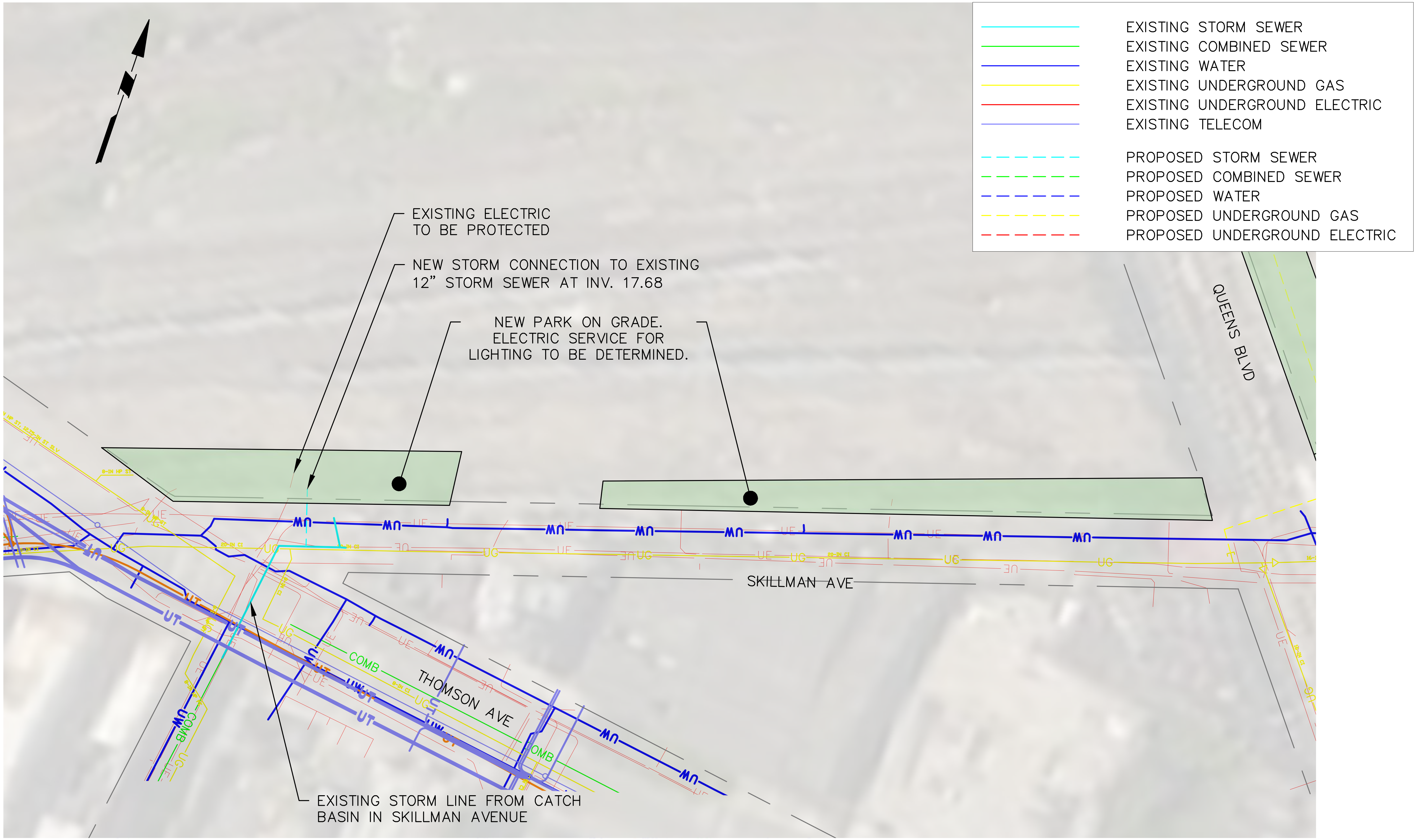

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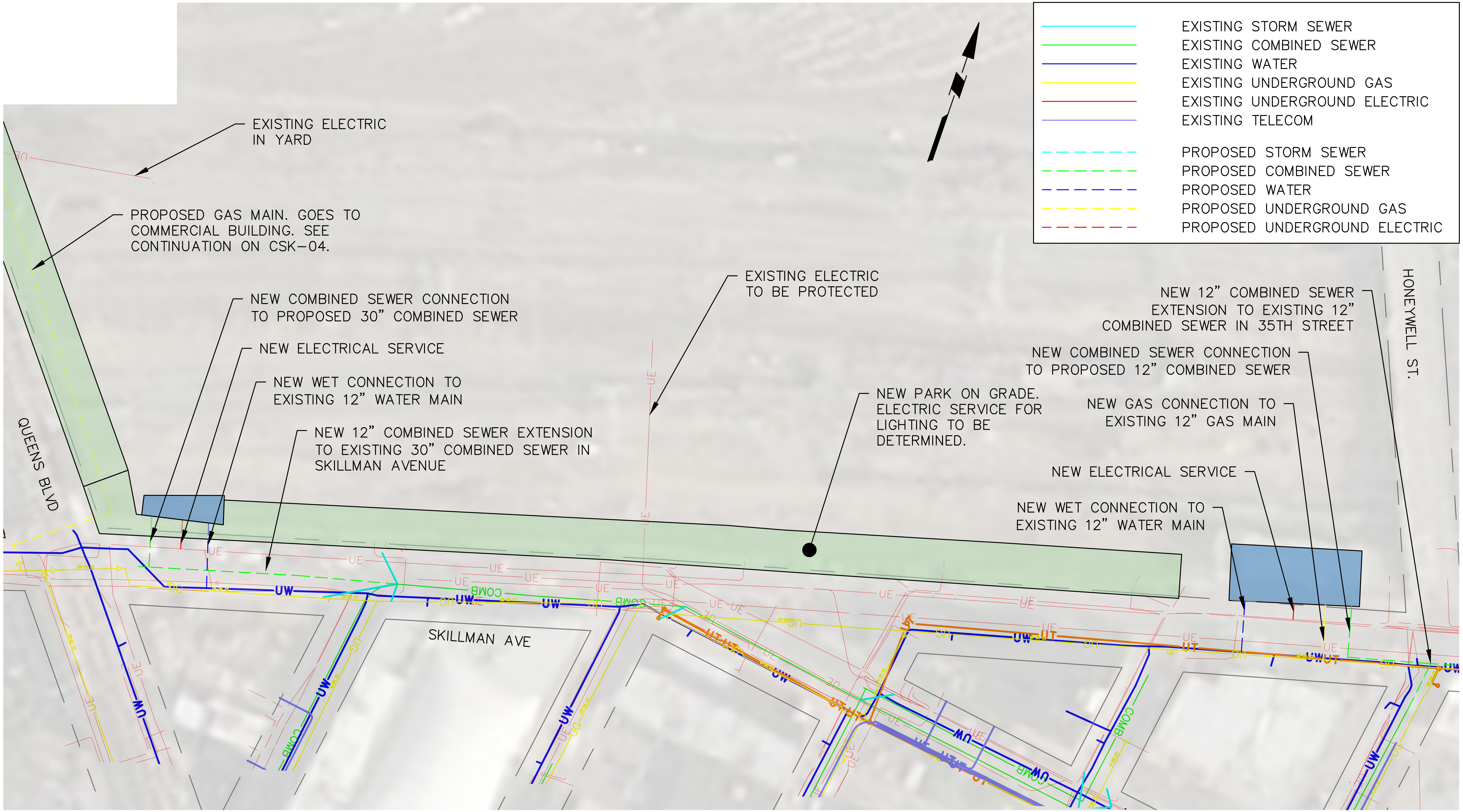
Project
SUNNYSIDE YARD MASTER PLAN
SUNNYSIDE
QUEENS NEW YORK

Drawing Title
DRAINAGE AREA PHASE 0-1 UTILITY PLAN

Project No. 170522401
Date 09/05/2019
Drawn By RND
Checked By LB

Drawing No.
CSK-02
Sheet 2 of 5

Filename: \\langan.com\data\NYC\data4\170522401\Project Data\CAD\01\SheetFiles\Civil\2019-09-06 Narrative Utility Plans.dwg Date: 9/6/2019 Time: 19:14 User: rdolin Style Table: Langan.stb Layout: CSK-02



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100 0 50 100
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LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

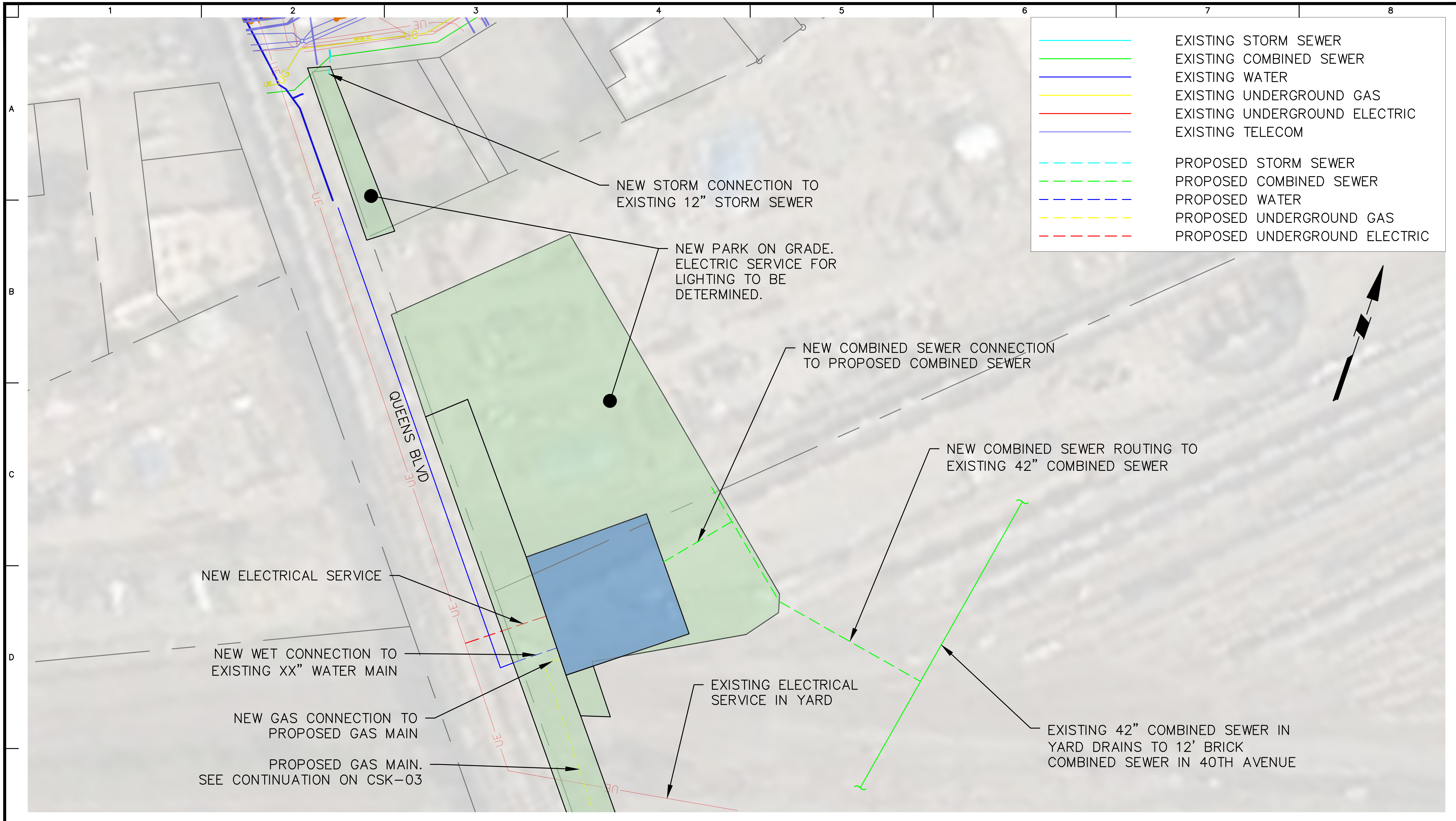
Project
SUNNYSIDE YARD MASTER PLAN
QUEENS SUNNYSIDE NEW YORK

Drawing Title
DRAINAGE AREA PHASE 0-2A UTILITY PLAN

Project No. 170522401
Date 09/05/2019
Drawn By RND
Checked By LB

Drawing No.
CSK-03
Sheet 3 of 5

Filename: \\langan.com\data\NYC\data4\170522401\Project Data\CAD\01\SheetFiles\Civil\2019-09-06 Narrative Utility Plans.dwg Date: 9/6/2019 Time: 19:15 User: rdolin Style Table: Langan.stb Layout: CSK-03



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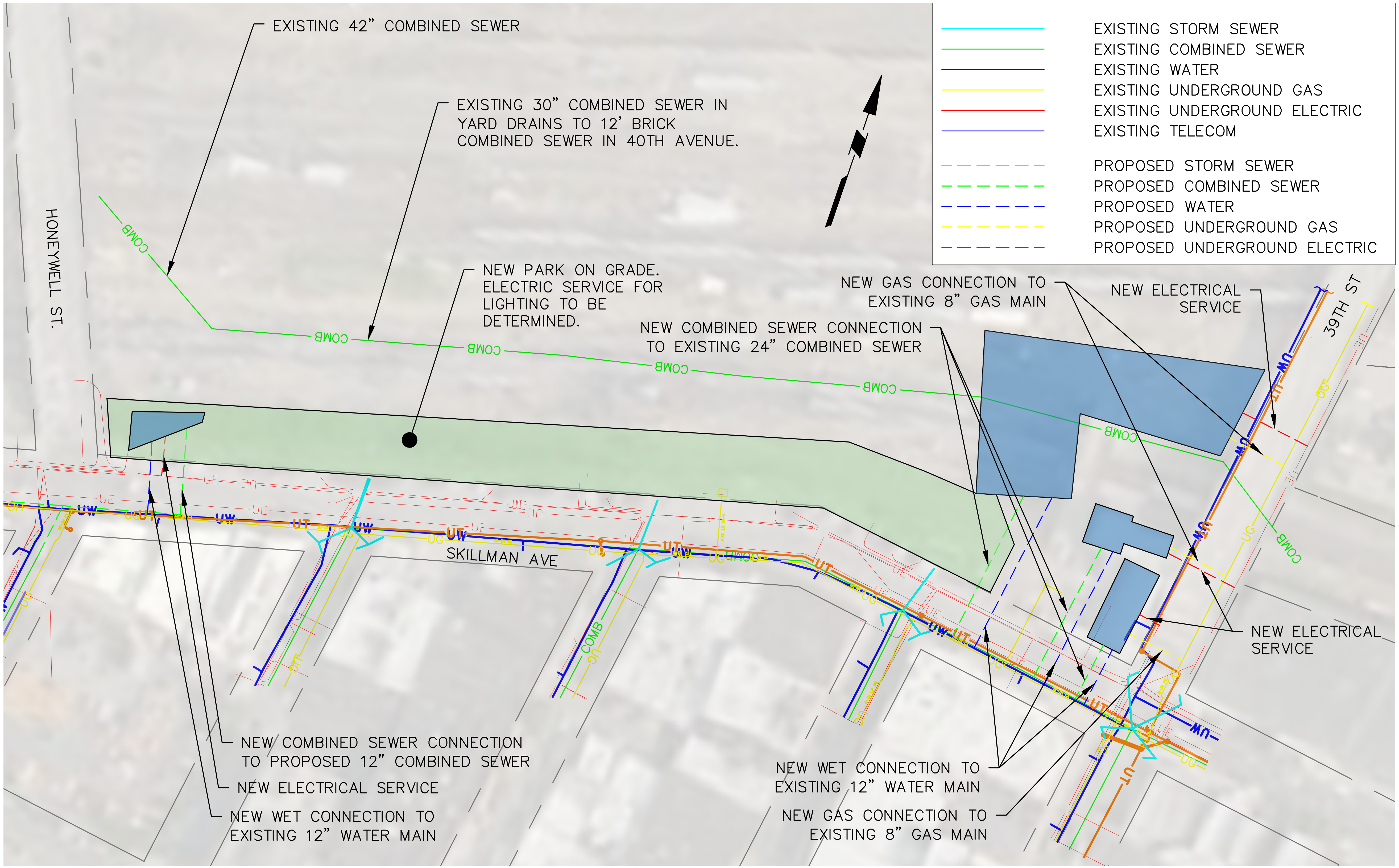
Project	Drawing Title	Project No.	Drawing No.
SUNNYSIDE YARD MASTER PLAN SUNNYSIDE QUEENS NEW YORK	DRAINAGE AREA PHASE 0-2B UTILITY PLAN	170522401 Date: 09/05/2019 Drawn By: RND Checked By: LB	CSK-04 Sheet 4 of 5

Filename: \\langan.com\data\NYC\data4\170522401\Project Data\CAD\01\SheetFiles\Civil\2019-09-06 Narrative Utility Plans.dwg Date: 9/6/2019 Time: 19:15 User: rdolin Style Table: Langan.stb Layout: CSK-04



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LANGAN Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. 21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com	Project **SUNNYSIDE YARD MASTER PLAN** SUNNYSIDE QUEENS NEW YORK	Drawing Title **DRAINAGE AREA PHASE 0-3 UTILITY PLAN**	Project No. 170522401 Date 09/05/2019 Drawn By RND Checked By LB	Drawing No. **CSK-05** Sheet 5 of 5

APPENDIX A.7.I

OVERBUILD OF AMTRAK RIGHT-OF-WAY DESIGN POLICY

SCOPE AND NATURE

The development of property resulting in a closed or partially enclosed overbuild structure over tracks, shall include design features to ensure adequate ventilation, illumination, emergency egress and fire protection to provide a safe environment for *Amtrak* employees and customers during normal and emergency operations. The Developer shall make all accommodations to the above grade structure, and shall be responsible for the design, construction and maintenance of the systems described below.

This document provides fire-life safety and diesel emissions design criteria for *Amtrak* enclosed station platforms, built-over tunnels, and tunnels. It is recognized that there may be more than one acceptable solution and *Amtrak* is prepared to review any scientific analysis that accomplishes the stated function and cooperate with the Developer to achieve a maintainable and effective overbuild system.

SPECIAL REFERENCE

The effective date of these SPECIAL REFERENCES shall be the date the Force Account Agreement of Covenants and Easements is signed by all involved parties.

Where NFPA is cited, this includes all "*Formal Interpretations*."

Where there is any conflict between this EP and any reference document, the most stringent applies.

American Railway Engineering and Maintenance-of-Way Association, AREMA Manual for Railway Engineering, including but not limited to Chapter 6*, Buildings and Support Facilities* and Chapter 8, *Tunnels.*

American Society of Heating, Refrigerating and Air-Conditioning Engineers, ASHRAE Handbook HVAC Applications, *Enclosed Vehicular Facilities*

Illuminating Engineering Society of North America, Lighting Handbook, Chapter 11

National Fire Protection Association,

NFPA 3, Recommended Practice on Commissioning and Integrated Testing of Fire Protection and Life Safety Systems.

NFPA 4, Standard for Integrated Fire Protection and Life Safety Testing.

NFPA 14, Standard for the Installation of Standpipe and Hose Systems”

NFPA 70, National Electrical Code.

NFPA 92B, Standard for Smoke Management Systems in Mall, Atria, and Large Spaces.

NFPA 101, Code for Life Safety Code from Fire in Buildings and Structures

NFPA 110; Standards for Emergency and Standby Power Systems

NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems including annexes as if cited in the body of the standard.

NFPA 502, Recommended Practice on Fire Protection for Limited Access Highways, Tunnels, Bridges, Elevated Roadways and Air Right Structures

U.S. Department of Labor, 29 CFR 1910, OSHA Safety and Health Standards

Van Nostrand Reinhold, Tunnel Engineering Handbook, Chapter 19, Tunnel Ventilation

United States Department of Transportation, Subway Environmental Design Handbook. Volume II, “Subway Environment Simulation Computer Program, SES Version 4.1, Part I User’s Manual”.

CITY OF NEW YORK {The below text within shaded boxed area applies to projects only within jurisdiction of FDNY. For other locations, consult with local governing agency.}

Fire Department New York “Fire Codes” including but not limited to Appendix B from 2014 Fire Code.

SPECIAL MATERIALS

Not applicable.

PROCEDURE

DEFINITIONS

Ventilation

A *station* is defined as a place for the purpose of loading and unloading passengers, including patron service areas and ancillary spaces associated with the same structure. An enclosed station platform is constructed in such a manner that it is not open to or substantially restricted to the atmosphere and smoke, and heat are not allowed to easily disperse directly into the atmosphere.

For example, the following existing and proposed structures are enclosed stations:

- Pennsylvania and Moynihan Stations at approximate milepost 0 from 9th Avenue to 7th Avenue in New York City, NY.
- Providence Station at approximate milepost 185 in Providence, RI.
- Back Bay Station at approximate milepost 227 within Back Bay Tunnel in Boston, MA.
- 30th Street Station at milepost 1.5 / MP 88.00 in Philadelphia, PA.
- Chicago Union Station from Madison Street to Congress Street in Chicago, IL.

A *built-over tunnel* is an enclosed trainway having two or more tracks. Built-over tunnels may be adjacent to a station, below an enclosing or covering structure, or a covered entry to a Yard and not having any separation between the tracks. Trains usually stop in built-over tunnels for five minutes or less during normal operations. Trains usually stop in built-over tunnels for 20 minutes or less during non-routine, non-emergency (congested operations).

For example, the following *Amtrak* structures are built-over tunnels:

- Overbuilds (Brookfield and Schulweis) of Moynihan Station approach from 9th Avenue to 10th Avenue at approximate milepost W0.7 in New York City, NY.
- Overbuild of Pennsylvania Station approaches from 7th Avenue to the portal in the vicinity of 6th Avenue at approximate milepost E0.5.
- Various contiguous and non-contiguous overbuilds along the Empire Connector from milepost 0.97 to milepost 5.28 in New York City, NY.
- Overbuild for Providence Place Mall development adjacent to Providence Station in Providence, RI.
- Back Bay Tunnel Overbuild from milepost 226.9 to 227.5 in Boston, MA.
- Overbuild north of Union Station from Madison Street to Randolph Street in Chicago, IL.
- Overbuild south of Union Station from Congress Street to Polk Street in Chicago, IL.
- Hudson Yards Development over LIRR West Side Storage Yard west of Eighth Avenue, NYC.

A *tunnel* is an enclosed trainway having one or two tracks, not including stations or built-over tunnels. Trains usually stop in tunnels for five minutes or less during normal operations. Trains usually stop in tunnels for 30 minutes or less during non-routine, non-emergency (congested operations).

For example, the following *Amtrak* structures are tunnels:

- North River Tunnels under the Hudson River from 10th Avenue at approximate milepost W0.7 in New York City, NY to Bergen Portal at approximate milepost W3.0 in North Bergen Township, Hudson County, NJ.

- East River Tunnels under the East River from the portal in the vicinity of 6th Avenue at approximate milepost E0.5 the Long Island City Portal at approximate milepost E2.5 in New York City, NY.
- Empire Connector North Access Tunnel from approximate milepost 0.41 (10th Avenue Portal) to approximate milepost 0.71 in New York City, NY.
- New Haven Tunnels between approximate mileposts 76.4 and 76.7 in New Haven, CT.
- Three B&P Tunnels from North Avenue Portal at approximate milepost 95.9 to Gilmor Street Portal at approximate milepost 97.5 in Baltimore, MD.
- Union Tunnel from Bond Street Portal at approximate milepost 94.6 to Greenmount Avenue Portal at approximate milepost 95.2 in Baltimore, MD.
- First Street Tunnel from First Street Portal at approximate milepost 134.8 to South Capitol Street Portal at approximate milepost 137.0 on Washington, DC. First Street Tunnel has the “Fan Tracks” or Subway in addition to Station Building and link structure / parking garage ramp; these are all considered to be a hybrid condition

Any overbuild project in the City of New York, shall be considered an *Enclosed Station Platform* or a *Built-Over Tunnel* as defined herein and regardless of actual length shall require mechanical ventilation, lighting, fire protection, equipment to ensure adequate radio communications for the railroad road channel, *Amtrak* Police Department and the New York City Fire Department.

At least one means of egress (an enclosed fire rated stairway if the means of egress is above track level) away from track level. The use of alternating tread design (ships ladder) is permitted only as a means of ingress and only where endorsed by FDNY.

Where an overbuild project depends upon an adjacent property for any systems or elements, such as standpipes, means of egress, etc. the Developer shall submit with initial design submission a clear statement of intent and follow up with submission for final acceptance with copy of executed legal agreement. This agreement shall also identify that Amtrak, and its successors, have the inherent right to monitor for compliance, etc. -

Plans must be submitted to the New York City Fire Department, Bureau of Fire Prevention and the Bureau of Operations Public Transportation Safety Unit, for review and approval.

Projects occurring over the Empire Line shall have fire department standpipe hose valves secured inside Potter Roemer Fire Protection Equipment “NYCT Valve Cabinet (surface) per Potter drawing 12208-36 dated 03-10-03, or approved equal, with modification to use FDNY lockset.

ENCLOSED STATION PLATFORMS and BUILT-OVER TUNNELS

Station public-area fire-life safety facilities shall be in accordance with NFPA 130. Station non-public area (ancillary spaces) fire-life safety facilities shall be designed as per local codes.

Built-over tunnel fire-life safety facilities shall be in accordance with NFPA 130, except that emergency egress facilities shall be sufficient for all those that can self-rescue to exit within 30 minutes.

Built-over non-public area (ancillary spaces) fire-life safety facilities shall be designed as per local codes.

Stations shall be designed to provide a tenable environment in accordance with NFPA 130 Annex B for a period of at least 30 minutes.

Built-over tunnels shall be designed to provide a tenable environment in accordance with NFPA 130 Annex B for a period of at least 60 minutes.

Station ventilation systems shall be designed for train fires, platform fires and wayside fires.   Tunnel ventilation systems may be used for the ventilation of stations and built-over tunnels and vice versa.

A platform or wayside fire may involve trash, maintenance materials or other combustibles.   The fire heat release rate for a platform fire shall be one megawatt (MW) (3.412 million British Thermal Units per hour [MBtu/hr]).   The fuel burn rate shall be 0.0254 kg/s (0.0556 lbm/s).   The combustion products release rate shall be 0.3624 kg/s (0.7992 lbm/s).   The opaque products release rate shall be 0.0042 kg/s (0.0092 lbm/s). (Note: this data is written to three or four-decimal place accuracy to assist the comparison of simulation outputs by different engineers.   This does not imply the accuracy of the data).

The platform or wayside fire growth rate shall be “fast” as defined by NFPA 92. A fast fire growth rate is parabolic at 46.892 w/s^2 (160 Btu/hr - sec^2) and reaches 1 MW (3.412 MBtu/hr) in approximately 150 seconds. A train fire is a fire beginning in one car of a train and spreading to other cars in the same train and to other trains that are in the station.   The means of egress of the involved train set shall be via the most remote door exit on the car adjacent to the car involved in the incident depending upon the type of equipment.

Amtrak will, upon request, define the details of the train set consist and consist equipment to be used as the design basis. Following train fire heat and fire smoke release rates shall be used in the ventilation analysis for enclosed stations and built-over tunnels having two or more tracks not separated by a platform.

TIME	HEAT RELEASE RATE	HEAT RELEASE RATE
Seconds	MW	MBtu/hr
0	0	0
180	5	17.060
600	5	17.060
780	10	34.120
1200	10	34.120
1560	52	177.476
> 1560	52	177.476

The fuel burn rate shall be 0.0254 kg/(s-MW)[0.0164 lbm/(s-MBtu/hr)].

The combustion products release rate shall be 0.3624 kg/(s-MW) [0.2342 lbm/(s-MBtu/hr)].

The opaque products release rate shall be 0.0042 kg/(s-MW)(0.0269 lbm/[s-MBtu/hr]).

The following train fire heat and fire smoke release rates shall be used in the ventilation analysis for enclosed stations and built-over tunnels having one track, or two tracks separated by a platform.

TIME	HEAT RELEASE RATE	HEAT RELEASE RATE
Seconds	MW	MBtu/hr
0	0	0
180	5	17.060
600	5	17.060
780	10	34.120
1200	10	34.120
1380	31	106.200
> 1380	31	106.200

The fuel burn rate shall be 0.0254 kg/(s-MW)(0.0164 lbm/[s-MBtu/hr]).

The combustion products release rate shall be 0.3624 kg/(s-MW) (0.2342 lbm/[s-MBtu/hr]).

The opaque products release rate shall be 0.0042 kg/(s-MW)(0.0269 lbm/[s-MBtu/hr]).

The emergency ventilation analysis shall be done using publicly available computational fluid dynamics (CFD) software such as FLUENT, CFX, Star-CD. Certain geometries may be analyzed either by using the CFD Package FDS or by not using CFD at all. *Amtrak* may approve the use of FDS or the waiver of CFD after the engineer submits a request documenting the appropriateness of the recommended change.

The design philosophy of an enclosed station or built-over tunnel ventilation system shall be to maintain a tenable environment in the path of evacuation for the time periods specified above. Note the ventilation system may mechanical or non- mechanical (natural or buoyancy driven).

However, tunnel ventilation systems which depend on interface with adjacent properties or developers, such as for source of makeup air, shall submit with initial design submission clear statement of intent and follow up with submission for final acceptance with copy of executed legal agreement. This agreement shall also identify that Amtrak, and its successors, have the inherent right to monitor for compliance, etc.

Design for Diesel emissions shall be as per A*SHRAE HVAC Applications Handbook.* The design criteria shall be 5 ppm of nitrogen dioxide at an elevation of 14 feet above the top of rail. The ventilation systems shall be energized when the NO2 concentration at this elevation reaches 3 ppm. In the event that normal operations train idling is no greater than ten train-minutes per hour, no analysis need be made. Instead, it shall be assumed that the emergency ventilation systems can be operated in such a manner as to purge diesel emissions from the station or built-over tunnel when the 3 ppm concentration is reached.

TUNNELS

Tunnel fire-life safety facilities shall be in accordance with NFPA 130. Tunnel non-public area (ancillary spaces) fire-life safety facilities shall be designed as per local codes. Trains usually stop in tunnels for 20 minutes or less during non-routine, non-emergency (congested operations).

The fire heat release rate used to design the tunnel ventilation system shall be 31.12 MW (106.2 MBtu/hr). The fuel burn rate shall be 0.7898 kg/s (1.7417 lbm/s). The combustion products release rate shall be 11.2788 kg/s (24.8667 lbm/s). The opaque products release rate shall be 0.1295 kg/s (0.2853 lbm/s).

The design philosophy of the tunnel ventilation system will be the control of the direction of smoke movement (i.e., the prevention of back-layering).

The analysis shall be done using the latest publicly available version of the Subway Environment Simulation (SES) computer program.

VENTILATION EQUIPMENT

Ventilation equipment and subsystems shall be as per NFPA 130. The words "for a minimum of one hour" in the Ventilation Chapter of NFPA 130 shall be replaced by "for one hour, or for the anticipated evacuation time plus 30 minutes, whichever is greater".

Ventilation Equipment and subsystems shall be designed to provide N+1 level of reliability unless Reliability Analysis as required by NFPA 130 requires higher level of reliability. Ventilation system reliability analysis that, as a minimum, considers the following shall be submitted to *Amtrak* for approval: Electrical; Mechanical; and Supervisory Control. [NFPA 130 7.2.3(7)].

Damper control motors / actuators, etc. shall be design to run to destruction in event of an incident.

The Developer shall be responsible to make sure (at their cost) that Ventilation systems for all overbuilds on the Empire Line shall be connected to and monitored by *Amtrak* Engineering personnel assigned to the "C3" Room, located on the 2nd Floor of 400 west 31st Street, Manhattan. Personnel in the "C3" Room must have the capability to operate these fans in the event of a failure of the automatic activation system(s) for the overbuild fans. Local control panels (for manual control of the fans) shall be located at each fan plant. Fan plants shall be connected to an emergency power source in the event of a power outage.

Illumination

Lighting shall be provided. Illumination levels of track and walking surfaces shall not be less than 2 foot-candles with a train in position (lights on opposite side of train will not provide illumination to bench wall on the opposite side. Exit lights, essential signs and emergency lights shall be included in an emergency lighting system powered by a standby power system as defined below. Unless specific color rendition is required, Light Emitting Diodes (LED) fixtures should be used for general illumination.

Egress

At least one emergency exit stairway shall be provided, and additional exits if required spaced so the distance to an emergency exit shall not exceed 800 feet. The stairway shall lead directly to the outdoors, or to a *safe refuge* area away from the railroad right of way. Signs shall indicate direction and distance to the nearest exit. Egress points shall be illuminated. Emergency telephones, in secure, protective boxes, compatible with the *Amtrak* wayside communications system, shall be provided by the Developer. If the Egress path uses a pocket or storage track, provide illumination in this area.

The overbuild developer/owner will maintain an adequate access/egress stairway(s), to include fire protection devices, lighting, stairs, handrails, landing fall protection and doors at street and track level. For security reasons the street level doors shall be equipped with cylinder locks keyed to an *Amtrak* "102 Key" lock. Heavy duty, secure lock boxes will be provided by the overbuild Developer/owner and permanently mounted next to, and slightly above the door at street level. An *Amtrak* "102 Key" will be provided by *Amtrak* and placed in the box for use by emergency responders.

The lock box will be secured with a New York City Fire Department "1620 Key" locks as appropriate.

Emergency and Standby Power Generation:

The Emergency Power Supply System, (EPSS), shall be classified as Level I (Life Safety) type 10 transfer time, and class 72 hours of run time per NFPA 110. Provide fixed load bank for onsite testing. This system shall be supervised by SCADA system integrated with Amtrak system.

Fire Protection

A dry fire standpipe system, minimum 4 inch, shall be provided when the length of the overbuild exceeds the maximum length of fire hose (permitted by the local authority having jurisdiction) minus the distance from the portal to the nearest hydrant or approved water source. The standpipe system shall extend under adjacent streets bridges or viaducts where no coverage exists. Where there may be pocket or storage tracks within the area of the project extend stand pipe coverage.

Security/Intrusion Detection Devices/Video Capability New York City Only

The Developer/overbuild owner shall provide and maintain intrusion detection devices and video surveillance equipment provided for all access and egress doors. These devices shall be connected via Amtrak furnished SCADA link to the *Amtrak* "C3" Room located at 400 West 31st Street, and monitored by *Amtrak* personnel.

Coordinate with Amtrak for data communication details. Developer shall provide video surveillance equipment providing full video coverage of the track bed where the use of pan-tilt-zoom (PTZ) is not permitted to achieve full coverage. The control room housing this equipment and control equipment serving emergency tunnel ventilation systems shall be fire rated and secure with Amtrak issued lock set. Where the local environmental conditions require the use of mechanical ventilation or cooling to maintain the space temperature below the electrical equipment operating limits, such mechanical ventilation or cooling systems shall be designed so that the failure of any single air moving or cooling unit or controls, does not result in the loss of the electrical supply, or control, to the emergency tunnel ventilation fans during the specified period of operation This applies where ever the subject control equipment is located. Power for this equipment shall be derived from EPSS.

Radio Communications

If required by *Amtrak* Radio Engineering the Developer/overbuild owner shall be responsible to provide and maintain equipment to enhance and ensure adequate radio communications for the *Amtrak* Road Channel and *Amtrak* Police Department radio frequency in operation for that area. This equipment shall be powered from EPSS. Coordinate with local authorities for additional requirements.

In addition the developer/overbuild owner shall provide and maintain equipment to ensure adequate emergency radio communication as required by the New York City Fire Department where applicable.

Commissioning and Integrated Testing:

Systems shall be commissioned per NFPA 3, Recommended Practice on Commissioning and Integrated Testing of Fire Protection and Life Safety Systems. Commissioning shall be performed by independent third party reporting directly to Amtrak but paid for by the Developer.

Integrated system testing shall be in accordance with NFPA 4, Standard for Integrated Fire Protection and Life Safety Testing.

Construction Period Restrictions.

During the construction period, the Developer shall not negatively impact the operations of the RailRoad or the ability of adjacent site(s) to provide required life safety functions as required by this Practice. This may mean the platform enclosing the over-build shall not completed until the systems being provided by this Developer are operational and accepted. Developer shall submit comprehensive CFD, or equal, modeling showing that the opening left in the platform will enable the required performance.

Noise Levels:

Provide acoustical modeling / analysis to confirm noise levels should be a maximum of 115 dBa for a few seconds and a maximum of 92 dBa for the remainder of the exposure.

Refuge Niches (bays)

Developer shall provide refuge niches (bays) in the adjacent crash walls in accordance with AREMA Manual Chapter 8, *Tunnels*, section 11.2.7 requirements to allow Amtrak roadway workers to safely clear the tracks for passing trains. Provide similar niches, such as in bench walls of tunnels, under platforms, etc. where similar conditions are appropriate.

Local Authorities Review and Approval

Plans, CFD models, etc. must be submitted to the New York City Fire Department, Bureau of Fire Prevention and the Bureau of Operations Public Transportation Safety Unit, for review and approval. Submit concurrent copy to Amtrak for coordination.

REPORTING

Not Applicable.

RESPONSIBILITY

Designers of overbuild structures.

Comply with standards and procedures.

Deputy Chief Engineer, Structures

Review design submittals for compliance.

Division Engineer

Ensure compliance with EP 4006 with an inspection program, where all of the systems outlined in the current EP 4006, and the recommendations in this memo are inspected routinely (by *Amtrak* personnel) for compliance by the responsible developer/overbuild owner.

During construction, the site should be inspected at least weekly (more frequently if dictated by conditions at the site) by *Amtrak* personnel. A site specific checklist should be developed by the Developer so the *Amtrak* employee inspecting the site is aware of the life safety and security issues of interest to *Amtrak* (as dictated by *Amtrak*, *Amtrak* EP 4006, NFPA 130, the New York City Fire Department)

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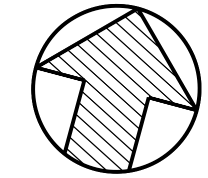
APPENDIX A.7.J

OVERALL FIRE PROTECTION SYSTEM WITH STANDPIPE NETWORK WITHIN YARD AREAS



FIRE HYDRANT AND FIRE DEPARTMENT CONNECTION LOCATIONS

LEGEND

- STANDPIPE HOSE VALVES
- EXISTING FIRE HYDRANT (FROM EXISTING UTILITIES CAD DRAWINGS)
- PROPOSED EXISTING FIRE HYDRANT
- PROPOSED FIRE DEPARTMENT CONNECTION LOCATION
- PROPOSED FIRE PUMPER TRUCK LOCATION
- 6" FIRE STANDPIPE
- FIRE HOSE
- FIRE RATED SEPARATION WALL

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: JYL
DRAWN BY: OM
CHECKED BY: JMS
APPROVED BY: SC

HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

IT IS A VIOLATION OF SECTION 7209.2 OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER IN ANY WAY PLANS, SPECIFICATIONS, PLATS OR REPORTS TO WHICH THE SEAL OF A PROFESSIONAL ENGINEER HAS BEEN APPLIED. IF AN ITEM BEARING THE SEAL OF A PROFESSIONAL ENGINEER IS ALTERED THE ALTERING ENGINEER SHALL AFFIX TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE, THE DATE, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

NYCEDC

SUNNYSIDE YARD MASTERPLAN
OVERALL FIRE PROTECTION SYSTEM

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE 8/28/2019
DRAWING NO.
SHEET OF

APPENDIX A.7.K

VENTILATION EVALUATION FOR FIRE

Ventilation Evaluation for Fire

Conceptual Engineering Analysis using CFD

In order to realistically evaluate fire characteristics and fire movement below the deck area, Initial Computational Fluid Dynamics (CFD) simulations has been performed for this study using Fire Dynamics Simulator (FDS) software developed by National Institute of Standards and Technology (NIST).

Figure 26 describes the deck area highlighted in the red line box which is modeled for the CFD analysis. This ventilation zone is part of the Sunny Side Yard and is selected for CFD study due to its approximate low ceiling clearance.

Simplified crash walls separation between several tracks within the region are modeled to create more realistic representation of the CFD study area as shown by cropped CFD model of figure 27.

Due to variance of ceiling clearance between ground and the concrete slab of the lid, two different lid configurations are modeled in this study. In the staggered lid configuration as shown in figure 28, to represent the slope down towards Queens Blvd, with lowest ceiling clearance of 17'-5" and highest ceiling clearance of 27'-9". In the flat lid configuration as shown in figure 29, lid is assumed to be flat thus the overall study area has uniform 27'-9" ceiling clearance. Both west end (Queens Blvd) and east end (Honeywell St.) of the two CFD models are open to the outside, and without any walls (natural ventilation).

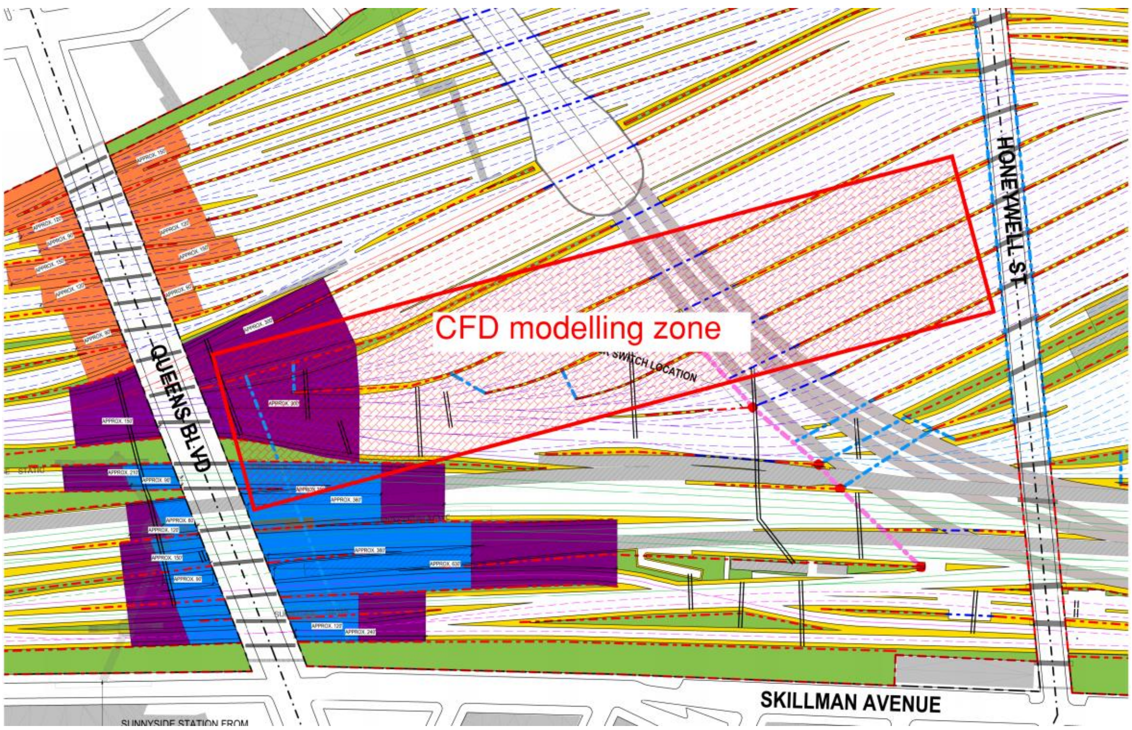


Figure 26. Plan View of CFD Test Study Area

Figure 27. Cropped CFD Model with Simplified Crash Walls Configuration

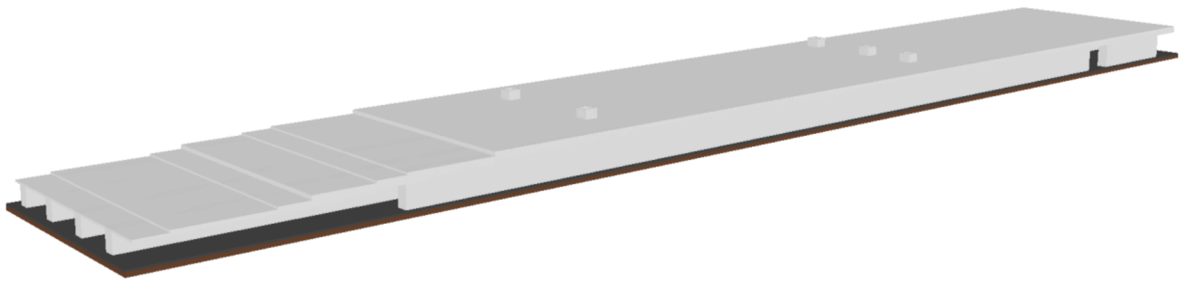


Figure 28. CFD Model Representation of Staggered Lid Configuration

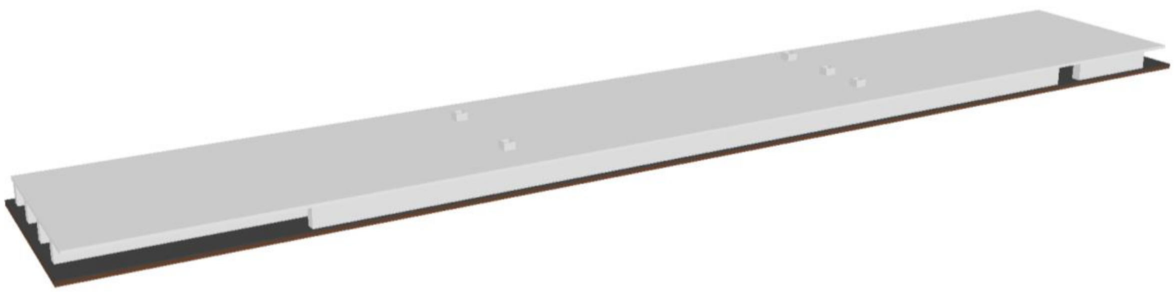


Figure 29. CFD Model Representation of Flat Lid Configuration

Fire design scenarios proposed in this study are recommended based on rail and other vehicles operating within train platform gallery region under the train shed area of the station. These design fire scenarios are consistent with the "Overbuild of Amtrak right-of-way design policy". Two fire scenarios (train fire below platform concourse within train shed area, and locomotive fire) are described below.

1. Train Fire Below Rail Yard and Operations Area Lid

In this scenario, the fire is assumed to start maliciously from a passenger seat in a stationary train below platform concourse within rail yard and operations lid area. If a fire is ignited maliciously, the initial fire source may involve the use of a limited amount of accelerant. The fire is assumed to be directly adjacent to a non-incident train such that the fire can spread from one passenger coach to another and reach a peak heat release rate of 52MW with three periods of growth. Within the first three minutes, the fire reaches 5MW of HRR and remains constant for the next seven minutes. The fire then linearly grows to 10MW of HRR within three minutes and remains constant for the next seven minutes. After the constant period, the fire then linearly grows again to 52MW within six minutes and remains constant until the conclusion of simulation at thirty minutes. Table 9 and Figure 30 provide the full breakdown list and graph of the fire growth rate applied in this study.

Time (s)	Heat Release Rate (MW)	Heat Release Rate (MBTU/hr)
0	0	0
180	5	17.060
600	5	17.060
780	10	34.120
1200	10	34.120
1560	52	177.476
>1560	52	177.476

Table 9. Table of Fire Growth Rate Applied in This Study

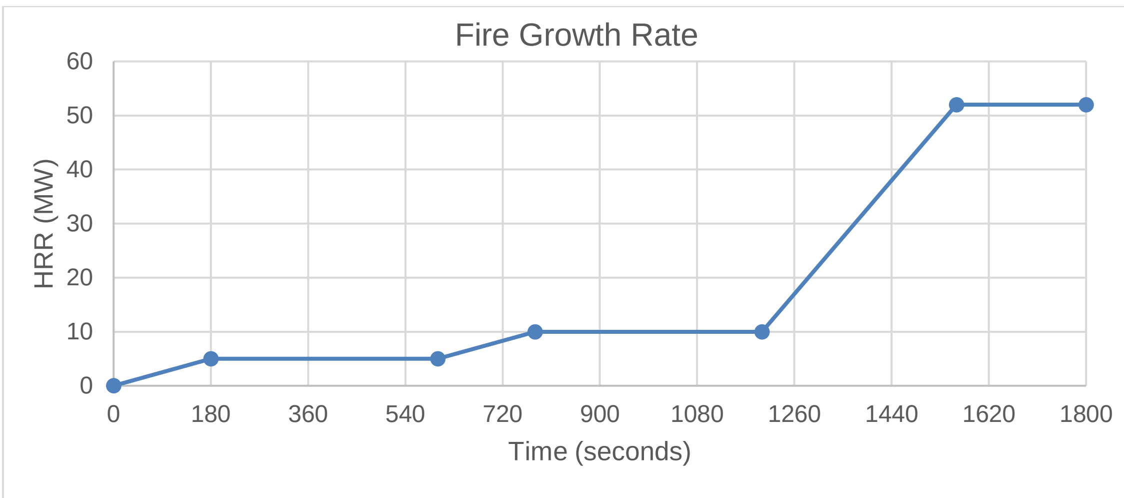


Figure 30. Chart of Fire Growth Rate Applied in This Study

2. Locomotive Train Fire

A diesel locomotive train fire in the rail yard and operations area lid enclosure is not considered a credible fire load due to the following reasons:

- In the event of abnormal operating conditions where a train is required to be pulled into lid enclosed rail operations area, special operation protocols will be followed. The lid enclosed rail operations area manager is expected to limit fire hazard risks to occupants through active control and monitoring of operations such as control of track exhaust ventilation systems and CCTV monitoring of train movement into the enclosed area.

3. Smoke management performance analysis

Identification of fire and life safety tenability is based on the design fire, occupancy type, fuel load and computer CFD modelling of fire dynamics. CFD modelling considered a credible fire load due to a train fire with a peak heat release rate (HRR) of 52 MW. The analysis has shown that the proposed exhaust capacity of 1,500 kCFM would be able to capture the smoke without propagate to the neighboring smoke zone.
Figure 31 shows the visibility at 2.5m above the floor in according with NFPA 130. This analysis has shown that the visibility is acceptable when examined against the acceptance criteria of 10 m at 2.5m above the floor level.

This has confirmed that the proposed mechanical ventilation strategy is acceptable.

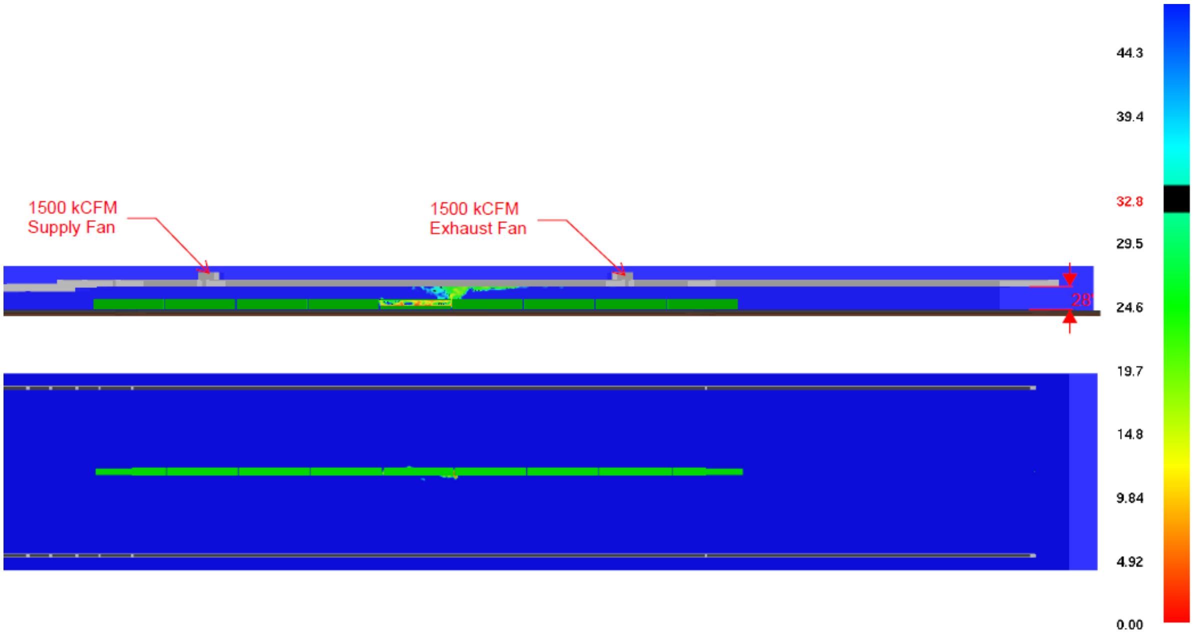


Figure 31. CFD modelling visibility showing the tenability under fire emergency conditions

APPENDIX A.7.L

FIRE AND LIFE SAFETY REQUIREMENTS

1. General Fire and Life Safety Aspects

Fire and Life Safety Requirements

Overview

Although the Public Realm Improvements would result in a much smaller amount of deck coverage in the short-term, determining the need for fire protection and ventilation systems are crucial to ensuring the safety of below-deck occupants. A summary of key takeaways was provided in the main body of the 3F Report, below is additional information.

Fire Detection System

It should be noted that ongoing rail operations beneath the deck will place special demands on fire protection equipment. It is therefore expected that metallic rail dust will be a challenge for the equipment and, depending on the specification, may require substantial maintenance. In addition, metallic rail dust also limits the functionality of the electromechanical equipment such as fire detectors. Optical detection solutions should use robust techniques that keeps the optics clean. Such devices can be mounted in areas where access for maintenance work is possible. A typical example for such a device is shown in Figure 1.1. The optical measuring section in this instrument is encapsulated and does not encounter the ambient air (product: VisGuard 2 In-situ; manufacturer: Sigrist Photometer AG).

Figure 1.1 – Example for a reliable fire detector in rough environments

Fire Sprinkler System

The merits of including a dry sprinkler must be critically evaluated in the course of further project planning. A wet sprinkler system would require more maintenance, would be susceptible to freezing, and railway operators typically discourage wet water pipes crossing over live railways for the following reasons:

- The traction power supply by the third rail and overhead contact system will be exposed to water, this is a major risk for staff and the FDNY. Before sprinkler systems start, the electricity / traction power supply must be switched off. Therefore, it is not proposed to use automatic sprinkler systems.
- Major fire loads are inside the rolling stock (seats, lining), if a fire occurs on board, the impact of the sprinklers is negligible.

- Fires on traction units might occur under the train, the impact of the sprinklers is negligible in those cases too.
- The sprinkler network would be wide with numerous nozzles about the track way. Access would always be an issue, specifically for installation and rare exchange of nozzles.
- Sprinkler nozzles would be clogged by metallic rail dust which is generated by braking and accelerating processes. Cleaning of nozzles is almost impossible during normal operation.
- Tests of the sprinkler systems cannot be conducted during normal operation.
- The train fire load is in a range where the use of sprinklers is questionable (several MW). Any kind of stratification would be destroyed by a sprinkler system, hot water steam may penetrate clothes from staff.

2. Other Safety Considerations

Emergency Lighting

Lighting can be required under the deck to support normal yard operations and maintenance work. Emergency lighting with emergency power and backup generation will also be required to meet applicable codes and guidelines. Amtrak requires illumination levels of track and walking surfaces of at least one (1) foot-candles with a train in position on an adjacent track. Lighting fixtures are expected to be mounted on the underside of the deck, support walls and structures. Temporary lighting will be required during deck construction.

Easy-to-access solutions should continue to be investigated during the next project phase. It might be possible to use emergency lighting and illumination for maintenance work within similar or the same systems. In some projects, rail tunnels have been equipped with hand rail integrated LED lights for both, emergency and maintenance lighting.

Figure 2.1 - Example for hand rail integrated LED lighting for emergency and maintenance operation

Signage

A signage system shall be used to guide during evacuation. The signage shall indicate directions and distances.

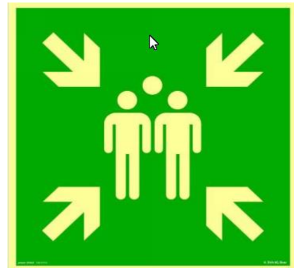


Figure 2.2 - Examples for evacuation signage with distances to the exit emergency exit / cross-passage (left) and the signaling the collection point (right) from [13]

Training

Regular exercises should be performed to train the staff, rescue services and operators for all kind of incidents (hot and cold). A training concept is required which covers the early construction phase, Public Realm Improvements, and also the operation after construction.

Power Sockets

Power sockets close to the evacuation / rescue path can be used by rescue teams for their equipment (e.g. cutting grinder, etc.), especially for cold incidents (derailment, collisions, etc.).

3. Structural Fire Durability Assessment - Design Fire Load

The Amtrak Right-of-Way Design Policy considers the applied design fire. According to this standard, a built-over tunnel shall be designed to provide tenable environment for a period of 60 minutes. A train fire is assumed to start from one car of a train and spread to other cars in the same train and to other trains in the station.

Sunnyside Yard design follows train fire heat and smoke release rates for build-over tunnels with two or more tracks not separated by platform standard as explained in. The total Heat Release Rate (HRR) and the convective HRR are outlined in the Amtrak Right-of-Way Design Policy.

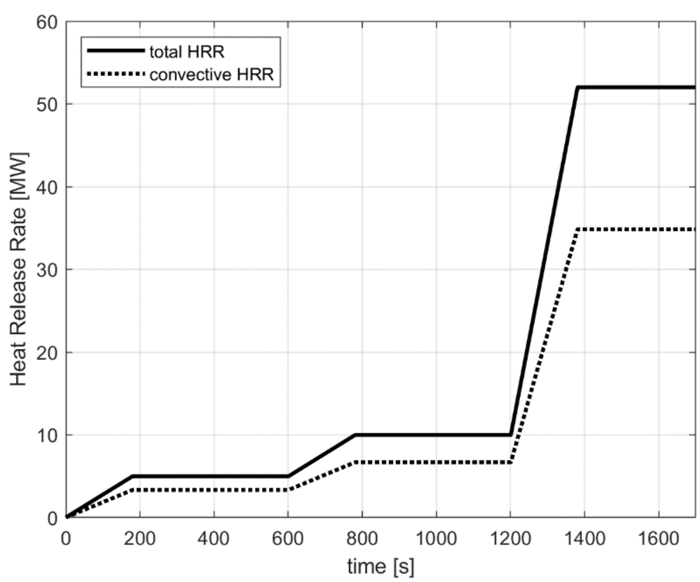


Figure 3.1 – Design fire proposal according to the AMTRAK Right-of-Way-Design-Policy - total HRR: bold line, convective HRR: dotted line

The (geometrical) fire size is related to the size of the coaches. It is assumed, that one entire coach (44.7 m^2) is burning during the full combustion phase and that a neighbor coach of the same train and a coach of a neighbor train start burning. However, it was found during underground fire tests with trains and train furniture (see [11] that reasonable fire loads did not exceed Heat Release Rates of approximately500 kW/m (see [11], [9]). This limitation is typically caused by the confined space in a coach with limited oxygen supply. It is therefore reasonable to estimate for the convective HRR of 34,840 kW a resulting fire size of 69.7 m2 (base on 500 kW/m^2) – which corresponds to the AMTRAK recommendation (see [7]): One burning coach and neighbor coaches (same train and neighbor train) start burning as well.

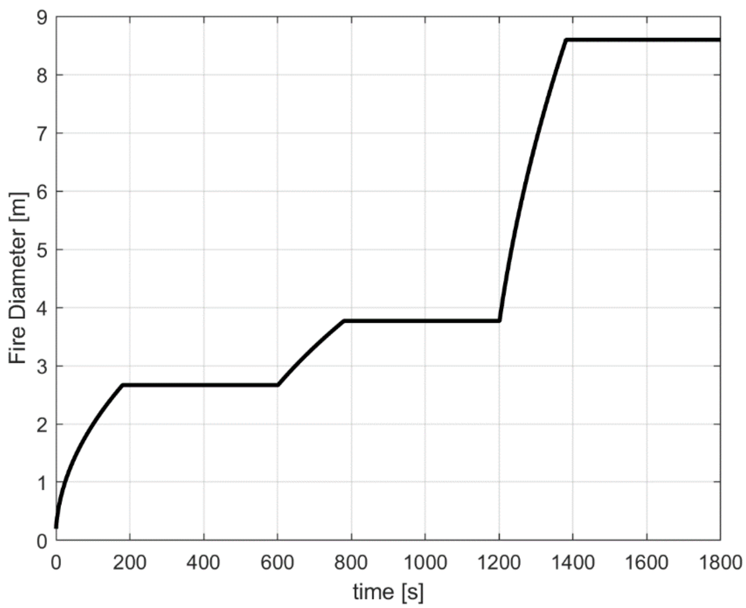


Figure 3.2 - Equivalent fire size when applying 500 kW/m^2 as a characteristic fire load

The flame height L_F is determined as follows (see [8], [1]):

$$L_F = -1.02D + 0.23\dot{Q}^{2/5} \quad [m]$$

With:

D	Fire Diameter	[m]
$\dot{Q}$	Convective HRR	[kW]

The following equivalent flame height LF can be found for the convective HRR (see [8], [11], [1]):

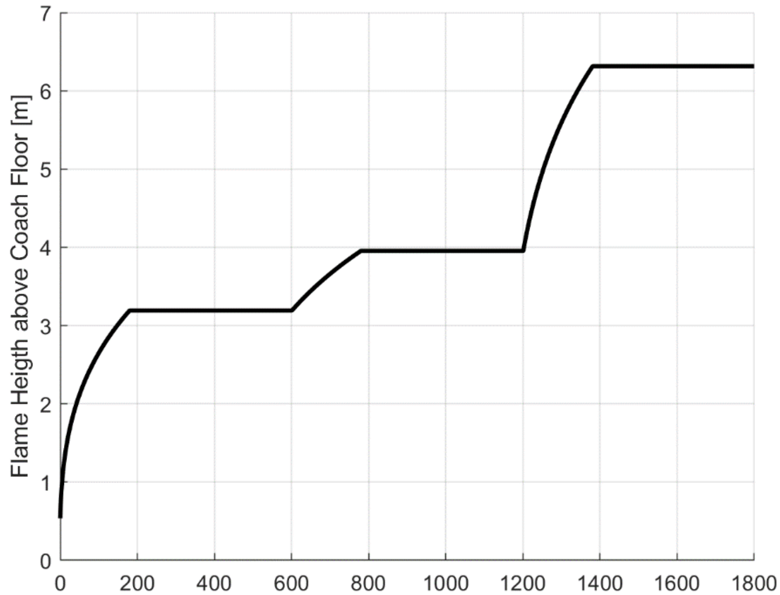


Figure 3.3 - Flame height

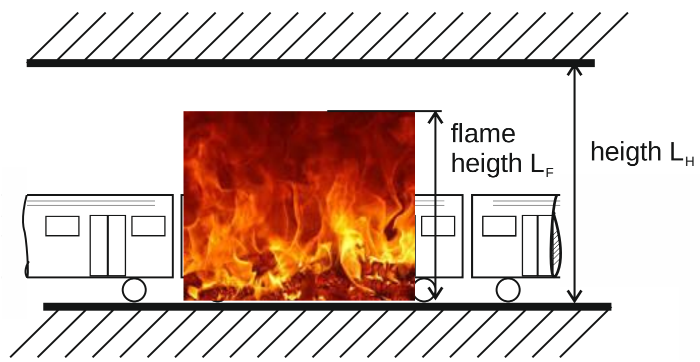


Figure 3.4 - Flame height and height above the car floor

The reduction of the flame height after approx. 1300 s corresponds to the fire spread to the neighbor cars. However, the flame height during the first 1200 s is approx. 6 m (19' - 8.22'').

The centerline temperatures can be determined as follows (see [8], [1]):

$$T_{Plume} = T_{Ambient+} \frac{18.8\,\dot{Q}^{2/3}}{(h - Z_0)^{5/3}} \; [°C]$$

With

H	Distance above fire surface	[m]
Z_0	Position of the virtual fire origin Z_0= -1.02D+0.083 $\dot{Q}^{2/5}$	[m]
$T_{Ambient}$	Ambient Temperature	[°C]
$\dot{Q}$	Convective HRR	[kW]

The approach proposed here with regard to flame height can be considered conservative, since in a typical train fire, flames and hot fumes escape through several burst windows (see Figure 3.5 below). A concentration of the fire energy from only one flame (as considered for the present approach) can only be achieved under exceptional circumstances when the roof structure fails at a very early burning phase.

Figure 3.5– Flames and hot smoke gases through several burst windows

At this early stage of design, the number, type and sizes of steel beams has not been determined yet. The present assessment for temperatures of load bearing structures is based on representative steel beam dimensions.

The temperature development of steel beams depends on their dimension, the most important parameter is the Am/V value, which describes the fire exposed perimeter of beam divided by the cross-section (see Figure 3.6).

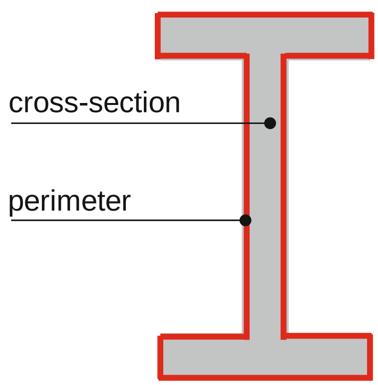


Figure 3.6 - Am/V value – based on fire exposed perimeter and cross-section.

The application of beams is important whether they are exposed with all four sides our with 3 sides (Figure 2.9). For the present assessment, it is assumed, that 3 sides of a beam will be exposed to the fire.

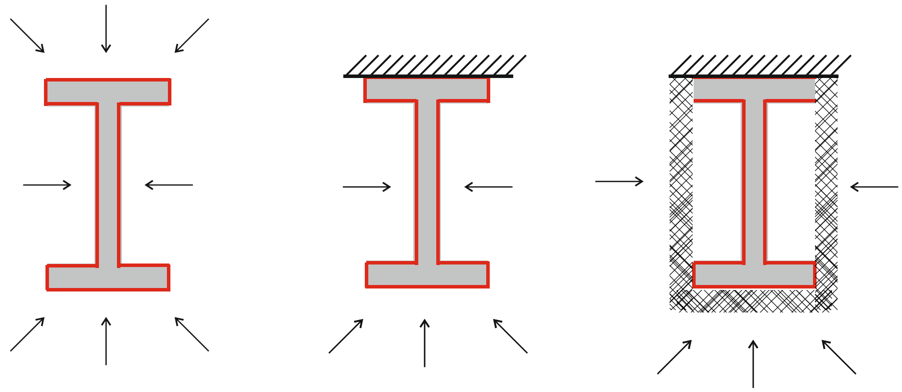


Figure 3.7- Beams can be exposed with all sides to the flames (left) or with three middle (center) or box-protected (right)

At typical steel beam of the type HEM is shown in Figure 3.8. For different beam dimensions the Am/V values for three-side flame exposed steel beams are compiled in Table 3.1.

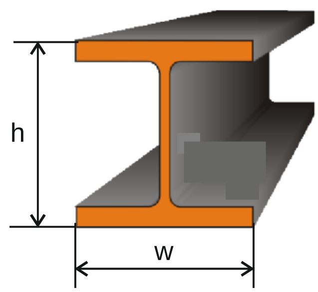


Figure 3.8- HEM-Beam

Type	**w [mm] / inch**	**w**	**Am/V (unprotected)**
HEM 100	106	120	96
HEM 200	206	220	76
HEM 300	310	340	50

Table 3.1 - Am/V values for different HEM-Beams

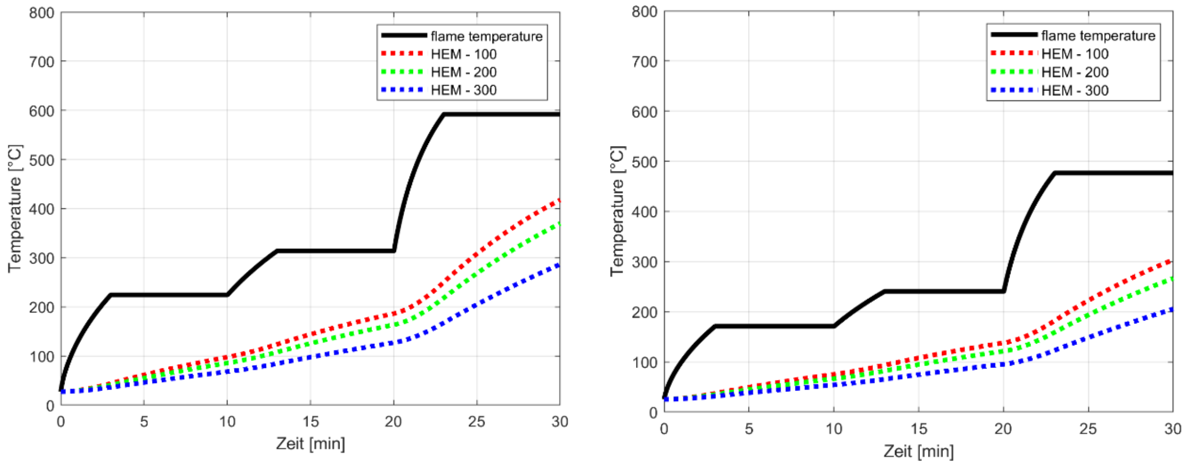


Figure 3.9 - HEM-Beam temperatures for a ceiling height 22 ft (left side) and for a ceiling height 26′-9″ (right side).

The estimated HEM beam temperatures for a ceiling height of 22 ft is even after 30 min still lower than 933 °F / 500 °C which. The situation is even better for a higher ceiling height (see Figure 3.9).

A beam temperature of approx. 933 °F / 500 °C is assumed to be critical for load bearing structures.

This first / preliminary estimation shows, that a conservative total Heat Release Rate of 52 MW does not lead to unacceptable beam temperatures. However, a more detailed assessment is required for the structural planning of the deck structure as design progresses.

Further in-depth analysis, specifically regarding the heat evolution of the hot smoke / air mixture and the impact of ventilation measures shall be performed during the next project phase with appropriate 3D methods. Furthermore, passive means to increase the structural fire durability (i.e. spray fire proofing, PPP fiber, housing of beams, etc.) shall be assessed.

4. CFD Analysis

During the construction phase, natural smoke extraction can take place through openings in the deck in the event of an incident. This has been confirmed with CFD analysis as shown in Figures 4.1 and 4.2.

The following parameters have been considered for the 3D simulations:

#	Parameter	Value	Source / Comment
1	Heat Release Rate	According to Figure 6.3	AMTRAK Design Policy / conservative value based on the assumption that fire spreads to neighbor train
2	Fuel Burn Rate	0.0254 kg/s.MW / 0.0164 lbm/s.MBtu/hr	Amtrak Design Policy
3	Combustion Products Release	0.3624 kg/s.MW / 0.2342 lbm/s.MBtu/hr	Amtrak Design Policy

4	Opaque Products Release	0.0042 kg/s.MW / 0.0269 lbm/s.MBtu/hr	AMTRAK Design Policy
5	Mesh Size	1 ft / 0.30	Applied mesh size / complies with requirements for fire engineering methods (see [9]).
6	Software for fire simulations	FDS version 6.6.0	Applied Software / generally acknowledged fire simulation software issued from the US National Institute of Standardization (NIST).
7	Turbulence model	Large Eddy Model (default model FDS)	Applied turbulence model / complies with requirements for fire engineering methods (see [9]).

Table 4.1 - CFD Analysis Parameters

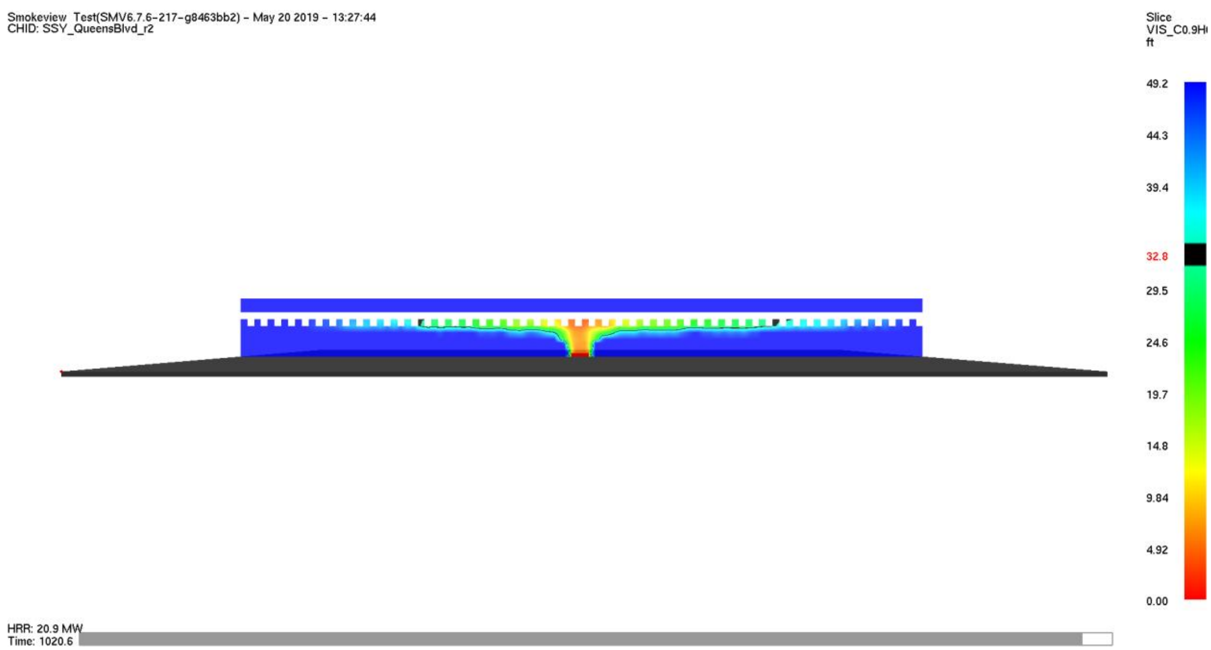


Figure 4.1 - Elevation view of tenability (Red area - untenable, Blue area - tenable)

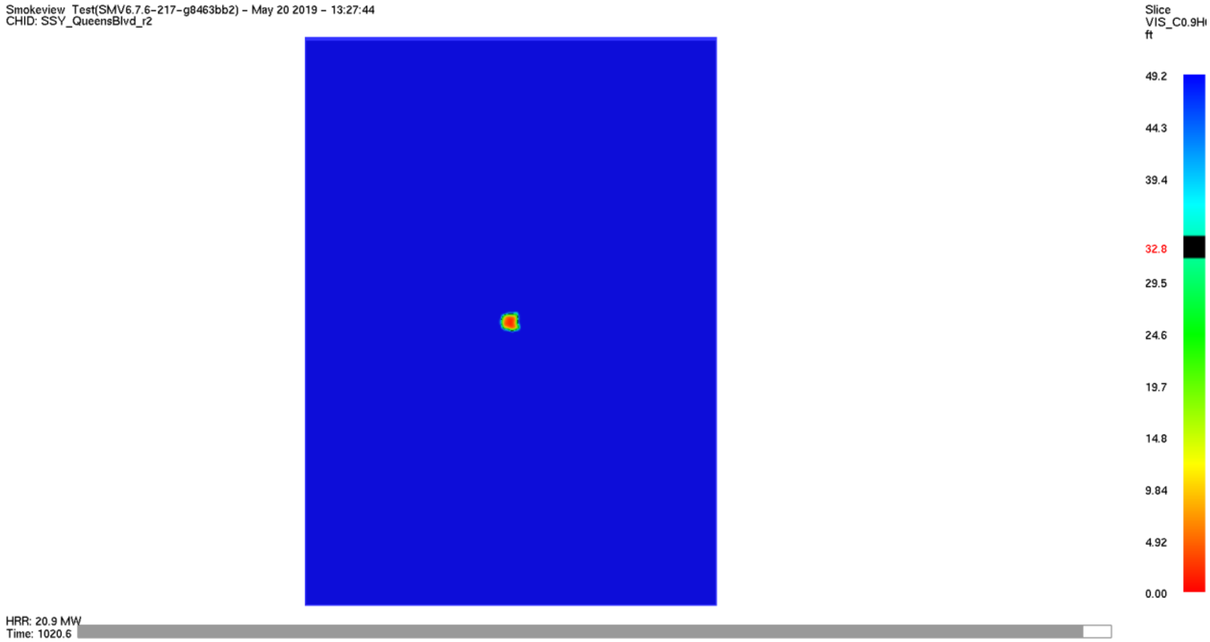


Figure 4.2- Plan view of tenability (Red area - untenable, Blue area - tenable)

The results of the 3D simulations show, that the height of the clear zone above ground is sufficient for evacuation. No natural or mechanical ventilation has been applied to the simulation. (See Appendix K for more information.)

5. References

Standards

[1] EN 1991-1-2: Eurocode 1: Actions on Structures – Part 1-2: General Actions – Actions on Structures Exposed to Fire, 2000

[2] EN 1993-1-2: Eurocode 2: Design of Concrete Structures – Part 1-2: General Rules – Structural Fire Design

[3] EN 1993-1-2: Eurocode 3: Design of Steel Structures – Part 1-2: General Rules – Structural Fire Design

[4] NFPA 502 – 2020, Standard for Road Tunnels, Bridges, and Other Limited Access Highways

[5] NFPA 130- 2017, Standard for Fixed Guideway Transit and Passenger Rail Systems

[6] Austrian Professional Fire Brigades Standard, RTVB 125 S, Smoke and Heat Exhaust Systems, 2010 – *only for information purpose*

Design Fire

[7] AMTRAK RIGHT-OF-WAY DESIGN POLICY, Revision 6, 09/11/2015

Further Literature

[8] NFPA, Fire Protection Handbook, 20th Edition Volume 1, Quincy, MA, USA, 2008

[9] Bauphysik Kalender, Ernst & Sohn a Whiley Company, Darmstadt, Germany, 2011

[10] Hosser, D., Kampmeier, B., Zehfuβ, J., Review of the applicability of Alternative Approaches according to Eurocode 1 part 1-2 for Determination of Fire Protection Requirements for Buildings, 2004

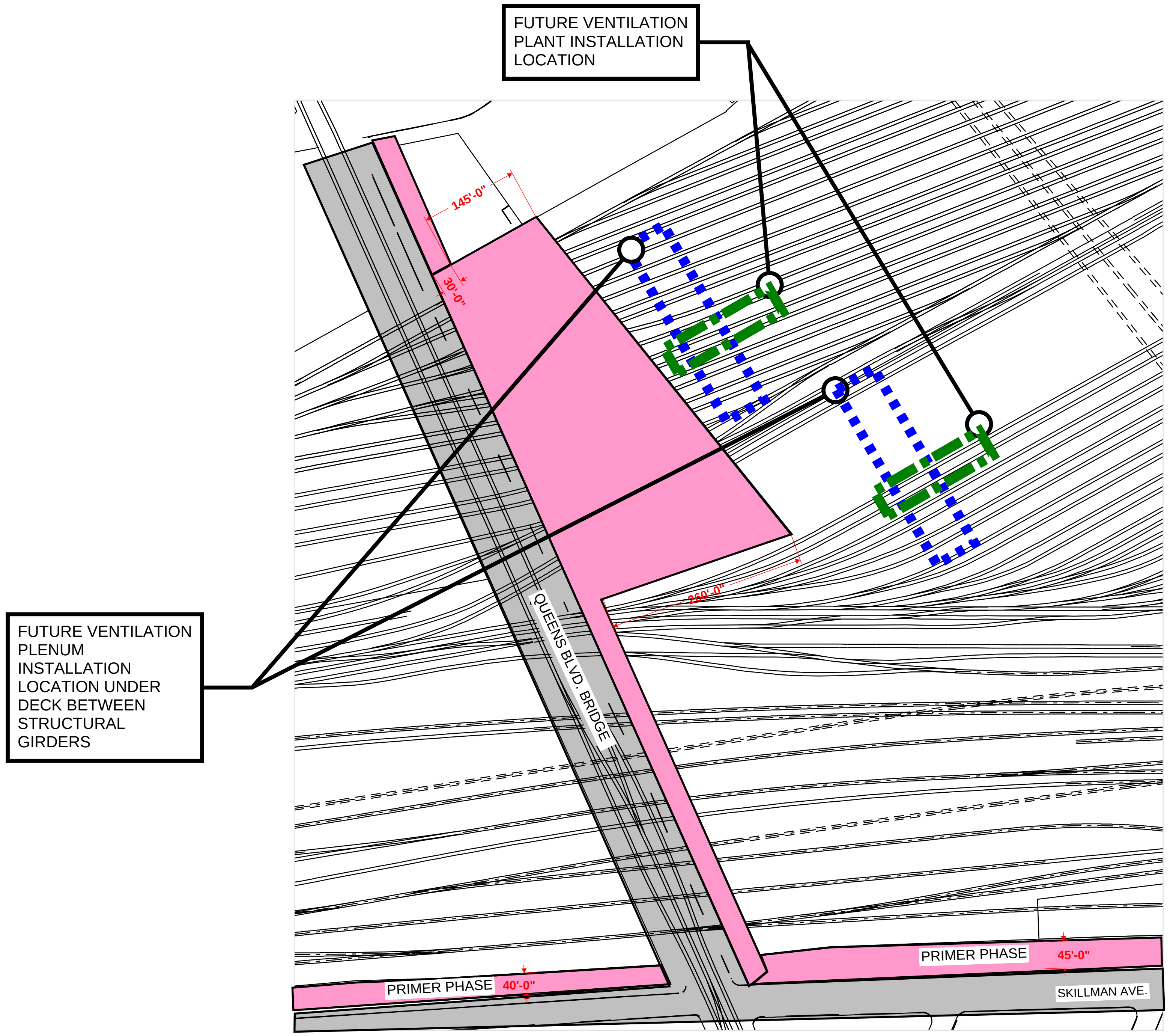
[11] Igarsson, H., Li, Y. Z., Lönnermar, A., Tunnel Fire Dynamics, Spriner Science and Business Media NY, 2015

[12] VDI 6019, Engineering methods for the dimensioning of systems for the removal of smoke from buildings – Engineering methods, Part 2, 2009

[13] I-20036, V1-0, Selbstrettungsmassnahmen im Tunnel, Infratrukturmassnahmen zur Erleichterung der Selbstrettung im Tunnel, SBB Infrastruktur, Personenverkehr, Cargo, 2015

APPENDIX A.7.M

VENTILATION PLANT LOCATION PLAN AND SECTION



PLAN VIEW OF VENTILATION PLANT LOCATION

LEGEND

- FUTURE VENTILATION PLENUM
- FUTURE VENTILATION PLANT
- PRIMER PHASE

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: JYL
DRAWN BY: OM
CHECKED BY: JMS
APPROVED BY: SC

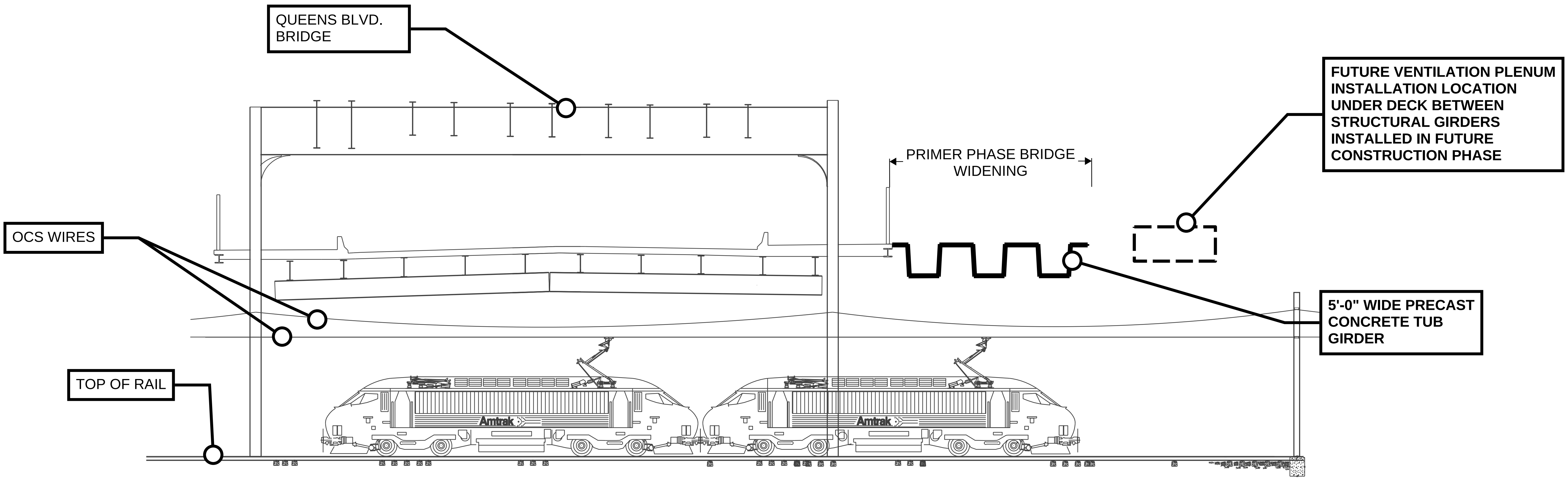
HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

IT IS A VIOLATION OF SECTION 7209.2 OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER IN ANY WAY PLANS, SPECIFICATIONS, PLATS OR REPORTS TO WHICH THE SEAL OF A PROFESSIONAL ENGINEER HAS BEEN APPLIED. IF AN ITEM BEARING THE SEAL OF A PROFESSIONAL ENGINEER IS ALTERED THE ALTERING ENGINEER SHALL AFFIX TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE, THE DATE, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

NYCEDC
SUNNYSIDE YARD MASTERPLAN
VENTILATION PLANT LOCATION

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE 8/28/2019
DRAWING NO.
SHEET OF



SECTION AT QUEENS BOULEVARD BRIDGE

NO.	DATE	DESIGNED BY	CHECKED BY	APPROVED BY	REV. NO.

DESIGNED BY: JMS
DRAWN BY: OM
CHECKED BY: JMS
APPROVED BY: JMS

HNTB
350 5TH AVENUE, 57TH FLOOR
NEW YORK, NY 10118

NYCEDC
SUNNYSIDE YARD MASTERPLAN
VENTILATION AND FLS CROSS SECTION

SCALE: NTS
FILE NAME:
REV. NO.

CONTRACT NO. –
DATE 8/28/2019
DRAWING NO.
SHEET OF

APPENDIX A.7.N

AMTRAK COMMENT RESPONSES

SSY Master Plan - COMMENT RESPONSE FORM

SUBMITTAL REVIEW COMMENTS / RESPONSES			
DOCUMENT NAME and REVISION NUMBER:	NYCEDC Sunnyside Yard Master Plan: Constructability Analysis	NYCEDC COORDINATOR:	Kate Ward
REVIEWER'S NAME(S):	Bruno, Biber, Edwards, Mohlenhoff, Hart	DEPARTMENT:	
REVIEWER'S ORG/DEPT:	Amtrak	DATE RECEIVED:	
REVIEW DATE:	7/2/2019	DATE DUE:	

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
			↓ COMMENTS MADE ON 07/17/18 SUBMITTAL NOT ADDRESSED ↓		
1	General	Bruno / Structures	**07/17/18 Comment:** Please provide design criteria (Basis of Design) for the overbuild structure.	TT	Design criteria is provided in the Comprehensive Master Plan Memo, which will be provided to Amtrak as a project deliverable.
2	General	Bruno / Structures	**07/17/18 Comment:** Clarify how AREMA train impact standards are being applied to the column design.	TT	Impact loading as defined by the AREMA train impact standards has been included in load combinations provided by ASCE 7, as referenced by the 2014 NYCBC.
3	General	Bruno / Structures	**07/17/18 Comment:** What will construction activities (contractor access, laydown area, etc) of overbuild have on Amtrak operations? Consider Amtrak's ability (manpower) for construction support.	HNTB/TT	Amtrak design approvals as project progresses and construction agreements will ensure Amtrak operations are not impeded during or after construction. Laydown areas and associated construction activities will be coordinated with Amtrak during future phases of the project development once contractors and project developers are involved. Master plan started preliminary force account estimates. As the design progresses these preliminary estimates will evolve.
4	General	Bruno / Structures	**07/17/18 Comment:** Clarify responsibilities and procedures properly dealing with excavated/disturbed fill presently in SSY.	Langan	Management of excavated/disturbed fill is the responsibility of the contractor performing the work, in accordance with the NYS DEC approved work plan.
5	General	Bruno / Structures	**07/17/18 Comment:** Will Amtrak have the ability to attach to overbuild structures in the future (OCS, signals, standard utilities)? Will the agreements give Amtrak the right to attach?	HNTB/TT	Yes, the reports document the intent for Amtrak to attach to overbuild structures, given the need for reduced clearances. This can be coordinated during future phases of the project, including Amtrak appurtenances in the design loads and criteria and coordination with developers on associated agreements.
6	General	Bruno / Structures	**07/17/18 Comment:** Amtrak Structures reserves the right for further comment and approval/contention on future further developed submissions. Future submissions should include a more refined plan set drawings so as to provide reviewable documents.	All	Noted.

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
7	General	Bruno / Structures	**07/17/18 Comment:** Clarify how Amtrak access to SSY be maintained throughout proposed construction and final conditions. Are additional access points warrented being the addition of an overbuild structure has the potential to disrupt access.	PAU	All existing access is maintained in place or replaced in kind nearby. Additional access to specific facilities directly from new road network—front doors with dedicated addresses—can be coordinated with Amtrak's evolving long term plans relative to more detailed design of specific phases of the over build.
8	General	Bruno / Structures	**07/17/18 Comment:** Clarify on future submissions how the high watertable experienced in SSY will be addressed. Due to limited access and equipment manuverability once an overbuild exists how will flooding be resolved? How will stormwater be managed?	Dharam	Master planning discussions to date have not included management of groundwater within the yard, aside from awareness of environmental concerns. Further design development and coordination with Amtrak with respect to impacts of overbuild on their maintenance and operations should include flood control and management.
9	Zone 2 HSR Facility	Bruno / Structures	~~**07/17/18 Comment:** Final design has been completed for Amtrak's HSR Facility,however the matrix indicates integration with overbuild structure. Will this require redesign? Who will pay for redesign effort?~~ A new HSR facility is no longer proposed. However it should be verified how the proposed overbuild might affect Amtrak High Speed Rail re-programming of the yard.	PAU	All new facilities would need to be coordinated with overbuilding construction for column placement and potential integration within deck for upper floors.
10	Zone 2 HSR Facility	Bruno / Structures	**07/17/18 Comment:** The matrix indicates 12KV feeders and signal power being relocated underground - considering the high watertable and the possibility for flooding is this ideal for Amtrak?	HNTB	This is not currently proposed, but the matrix noted it as a possibility for discussion . Amtrak will conduct design review and approvals as design progresses.
11	General	Bruno / Structures	**07/17/18 Comment:** Existing structures that need to be accomodated include Amtrak utility tunnel near Honeywell street.	HNTB	Noted.
12	General	Bruno / Structures	**07/17/18 Comment:** It appears the introduction of overbuild structure would create a less safe working condition for Amtrak employees considering blind spots and pinchpoints. How can safety be improved?	HNTB	Noted. Design will be coordinated with Amtrak during future phases of the project development.
13	General	Bruno / Structures	**07/17/18 Comment:** Include overview of responsibilities for maintenance of proposed overbuild structures. Consider: lighting, ventilation, water leakage, structure repairs et	HNTB	Noted. This will be developed as project enters design development.
			↓ NEW COMMENTS ON CONSTRUCTABILITY ANALYSIS ↓		
14	General	Bruno / Structures	Portions of the ROW within SSY are planned to be used as staging/laydown areas to facilitate construction work for future Amtrak Projects. Amtrak work and required space for project support should be prioritized for Amtrak's infrastructure improvement projects. Furthermore the proposed overbuild should coordinate with ongoing and/or future projects in/around the SSY area.	HNTB	Noted.
15	General	Bruno / Structures	**Epanding on Comment 14:** East River Tunnels 1 & 2 Reconstruction Project is in development and will require yard-wide civil works (from Portals 1 and 2 to potentially Sub 44). Work will include new manholes and underground duct banks. The space for these utilities and the area to perform the work must be preserved and clear of proposed overbuild foundations. Further coordination with Amtrak is required, locations to be developed in FY20.	HNTB	Noted.

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
16	General	Bruno / Structures	**Epanding on Comment 14:** East River Tunnels 1 & 2 Reconstruction Project is in development and will require yard-wide preparatory track work that will restore, upgrade or reconfigure several yard track layouts potentially including: Reverse signalnig of the Sunnyside Yard Loop Tracks, Sub 3 to Line 4 Connections Upgrade, Sub 4 to Line 2 Connection Upgrade, Sub 1 & Sub 2 to Line 2 Upgrade. This preparatory work may impact the proposed foundation/column layout. Further coordination with Amtrak is required.	HNTB	Noted.
16	General	Bruno / Structures	**Epanding on Comment 14:** East Side Access has several yard improvements remaining in their scope, the overbuild should coordinate with LIRR/Amtrak so that the proposed overbuild does not impact the planned construction operations. Improvements include: (1) Loop interlocking upgrades (2) Eastbound re-route construction (3) Westbound bypass construction.	HNTB	Noted.
17	General	Bruno / Structures	**Epanding on Comment 14:** The proposed work should integrate with / expand upon the River to River Rail Resiliency (R4) Project to provide flood / storm surge protection. This is necessary because the installation of a overbuild structure would preclude any future veritcal realignment.	HNTB	Noted.
18	General	Bruno / Structures	What are the Fire and Life Safety limitations on how much deck can be constructed before the associated lighting, ventilation and fire supression water / fire standpipe utilities are in place and commissioned? (A) Please indicate in the sequencing when these facilities will be installed. (B) Where will these new facilities reside (given that the yard is fully subscribed)? Given the life-critical nature, the facilities should be elevated out of the flood plain + anticipate sea level rise. (C) All of the new powered systems will need associated emergency back-up in place to consider DRP. (D) It should not be assumed that Amtrak can provide the power for these additional systems within existing capacity but Amtrak should be granted ownership and control of all new power sourcing and infrastructure.	HNTB	Noted. This will be developed as project enters design development. A Fire & Life Safety Task force is proposed in memos 3e and 3f to ensure all safety issues are developed to the satisfaction of Amtrak, MTA, FDNY and NYPD.
19	General	Bruno / Structures	Please indicate propose locations of new emergency egress points which must be incorporated into the overbuild design.	HNTB/PAU	3e and 3f memos indicate preliminary proposed access points.
20	General	Bruno / Structures	The proposed overbuild sequencing shows the existing Amtrak facilities being capped. Considering the Amtrak yard facilities must remain in operation at all times how will this be achieved? Will any duplicate facilities be provided (where applicable / practical)?	HNTB	Constructability approach to be further developed and coordinated with Amtrak as design progresses.
21	General	Bruno / Structures	**DEFER TO AMTRAK ET** Given the added geometric constraints to the yard footprint and modern requirements for flood + sea level rise design, a platform-level alternative to Substation 44 with room for future expansion may be advisable.	HNTB	Noted.
22	General	Bruno / Structures	**DEFER TO AMTRAK ET** Given the added geometric constraints to the yard footprint and modern requirements for flood + sea level rise design, relocation of all communication and signal huts to under-platform location above the 100-yr + flood elevation may be advisable.	HNTB	Noted.

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
23	General	Bruno / Structures	**Epanding on Comment 1:** Please indicate what surface live load design criteria is being utilized to determine the structural depth and potential spans of the overbuild deck system. Critical loading may be induced by cranes (especially when taking into consideration the Amtrak-mandated 150% overstrength factors for lifts of the ROW) or emergency vehicles.	TT	Design criteria is provided in the Comprehensive Master Plan Memo, which will be provided to Amtrak as a project deliverable.
24	General	Bruno / Structures	It appears a proposed column line is dropped crossing (and presumably bearing ontop) of East Side Access tunnels just south of Mainline 1 Track. Is this feasible?	TT	This column line has been eliminated from the intended scope of the project.
25	General	Bruno / Structures	Conceptual caisson / encased column designs shall be developed (as viewed in cross-track sections) and be reviewed by Amtrak Divisions/Mechanical for equipment clearance and safety requirements.	TT	Horizontal Track Clearances are discussed in the Comprehensive Master Plan Memo, and are demonstrated to be achievable in the framing plan diagrams. Future phases of design development may develop cross-track sections as indicated with Amtrak review for compliance.
26	General	Biber / C&S	All utilities, cable, and facilities located in the construction area must be located and protected before any construction takes place. This includes railroad and commercial utilities, cables, duct lines, and facilities. These activities will not be performed in close proximity to the Amtrak duct lines unless monitored by on-site Amtrak communications and signal (C&S) department personnel. Amtrak maintains the right to access all existing cables and conduits throughout construction. Amtrak also reserves the right to upgrade and install new cables and conduits in the affected area. Please contact Amtrak engineering to have all Amtrak underground utilities and assets located. Precautions must be taken to prevent any interruption to Amtrak's operation.	HNTB	Noted. This should go in the Division 1 Specs and on Notes page on future design drawings. Currently this information exists on the primer phase drawings from HNTB.
27	General	Biber / C&S	Amtrak C&S personnel must field-verify that there is no signal equipment in the way of the project and that signal preview is not being obstructed.	HNTB	Noted. This should go in the Division 1 Specs and on Notes page on future design drawings.
28	General	Biber / C&S	If any signal equipment is to be relocated, it must be reviewed by the division engineer. The division will contact John Mariotti, Sr. Manager Engineering, Signal Design and Standards for support in the design phase.	HNTB	Noted.
29	General	Biber / C&S	Signal preview must not be obstructed. Consultants performing work for Amtrak or on Amtrak property must show that there is adequate signal preview. In addition, all temporary structures, formwork, equipment, etc. Must comply during construction.	HNTB	Noted. Language added in 3E memo.
30	General	Biber / C&S	Rails must be protected against debris. Rust, sand, metal shavings or other material can interfere with the proper shunting sensitivity of the track circuit.	HNTB	Noted. This can be inserted in Division 1 Specs and Construction Agreements.
31	General	Edwards / C&S	If work shall be done on Amtrak property that involves heavy trucks, equipment, or machinery along the right of way, duct lines and pull boxes shall be inspected to insure they can withhold the appropriate weight. Refer to tier table document.	All	Noted

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
32	General	Mohlenhoff / Environmental	Need short narrative to summarize approach and summary of construcability analysis. Are all current Mechanical and engineering functionality /capacity being retained? Amtrak will not accept diminished operating capacity or ability. Hard to track that in figures. How are columns impacting operations?	Dharam/TT	Should the project move forward and as part of the next work phase there should be a comprehensive risk register developed including participation all stakeholders in order to capture and rank and cost/schedule - likelihood and impact.
33	General	Mohlenhoff / Environmental	Environmental: EDC indemnifies Amtrak for all work. They are generator of all waste materials, need NYSDEC approval prior to any work or development.	EDC	Noted
34	General	Mohlenhoff / Environmental	Conditions under deck. Same air quality under deck as above. Lighting, ventilation, diesel equipment operation, train operations and maintenance, utilities all need to be taken into account.	HNTB	Noted
35	General	Mohlenhoff / Environmental	Amtrak will convey no land to EDC.	EDC	noted
	General	Hart / Real Estate	Amtrak owns the Air Rights over Sunnyside Yard and any entity who builds over must acquire such rights from Amtrak	All	Noted
36	General	Hart / Real Estate	All plans should include the property lines and indicate the various property owners and the locations of all easement holders located thereon so that everyone knows who owns what	All	Noted
37	General	Hart / Real Estate	The MTA/LIRR does not hold any property rights in the middle of Sunnyside Yard on which they can construct and operate a Station as indicated on the plans	All	Noted

SSY Master Plan - COMMENT RESPONSE FORM

SUBMITTAL REVIEW COMMENTS / RESPONSES

DOCUMENT NAME and REVISION NUMBER:	NYCEDC Sunnyside Yard Master Plan: Skillman Ave Option	**NYCEDC COORDINATOR:**	Kate Ward
REVIEWER'S NAME(S):	Thomas Bruno, David Pittman. Rich Mohlenhoff, Charles Szovati, Thomas Horan	**DEPARTMENT:**	
REVIEWER'S ORG/DEPT:	Amtrak Engineering	**DATE RECEIVED:**	
REVIEW DATE:	9/13/2019	**DATE DUE:**	

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
1		Bruno / Structures	The Amtrak Engineering - Structures Group reserves the right to comment on and/or reject future submissions when more specific information becomes available.	HNTB	Noted.
2		Bruno / Structures	Please clarify the entire scope of the proposed Primer Phase. It is unclear if the Thomson Ave Greenway, Prototype Park, Civic Hub and Queens Blvd Greenway are included within the project scope.	PAU/EDC	Potentially all listed, items will be part of the scope, but could be some subset or individual element depending on what is progressed. For the purposes of the Master Plan all of the elements have been included in the cost estimate for the parks and greenways.
3		Bruno / Structures	The approved work would have to either accomodate or include the relocation of all conflicting existing Amtrak assets.	HNTB	Noted.
4		Bruno / Structures	Future submissions should include structural framing and foundation details of the proposed structure and specifically indicate the clearances to adjacent OCS and Track centerlines.	TT	Appendix G of the Task 3F memo provides conceptual framing and foundation plans, as well as some typical details. Clearances are specifically identified in Section 2 of the same memo.
5		Bruno / Structures	Future submissions should include an estimated constrution schedule indicating the anticipated construction staging requirements, the duration of utility relication work, and force account labor needed to complete each task.	Dharam	Noted. This will be provided as the project proceeds to the next design stage
6		Bruno / Structures	The proposed work should be designed/staged in such a way that SSY access via Skillman Ave is maintained throughout both the construction phase and in its permanent condition. Special attention should be given to ensure park use and/or propose parking conditions do not limit the accessibility of the yard (including turning radiuses).	All	Noted.
7		Bruno / Structures	A protection barrier including curved fencing meeting Amtrak Standard ET drawing ET-1446-D must be included along all exposed areas of the proposed overbuild. This will serve to protect the adjacent Amtrak ROW.	HNTB	Noted.
8		Bruno / Structures	All non-Amtrak utilities being installed/re-installed as part of the proposed work shall be designed and constructed in accordance with Amtrak's Engineering Practice 3005	All	Noted.

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
9		Bruno / Structures	The deck concept illustrations seem to indicate planters will be installed along the proposed greenways. Depending on what is intended to be planted, please locate them so over growth will not spill onto/over SSY.	PAU	Noted for further development.
10		Bruno / Structures	Considering the long-term interaction of this proposed overbuild with SSY, Amtrak Structures would prefer the structure be defined as described in "Case 1" of SSY-Primer Deck Concept Presentation with the following exceptions: (1) The foundation wall directly adjacent be a continous retaining wall. (2) The current sloped embankment be excavated/graded out so that the overbuilt area of SSY becomes useable space for Amtrak. (3) OH conduits attached to the overbuild structure are provided for Amtrak use. (4) Column spacing be provided at an interval that allows unobstructed access to the area beneath the proposed overbuild. (5) Adequate lighting is provided.	PAU/EDC	Noted. Space can be provided per alternate design drawing, but doing so adds significant cost to the project vs. retaining wall/back fill. Further conversations will be needed to determine extent of space needed and where is most useful relative to budgetary constraints.
11		Bruno / Structures	Please note that while it may not be wholly applicable at this time, as the eventual overbuild structure continues to progress across the yard this are will have to be analyzed from a NFPA standpoint. Perhaps it may be worthwhile to include fireproofing, egress, lighting or ventalation aspects a this time.	HNTB	Noted. 3f memo discusses current F&LS considerations for the Primer Phase even without the need for mechanical ventilation. As the project moves forward a Fire & Life Safety Task force is proposed to ensure all safety issues are developed to the satisfaction of Amtrak, MTA, FDNY and NYPD.
12	All	Rich Mohlenhoff (Environmental)	All work at SSY must conform to NYSDEC standards and guidance given SSY Status as Site # 241006.	All	Noted.
13	All	Rich Mohlenhoff (Environmental)	Any enclosures or covering of yard areas must allow for proper and safe air quality and environment, including lighting. Diesel powered equipment is used to move rolling stock and to maintain track and railroad infrastructure.	HNTB	Noted. 3f memo discusses current F&LS considerations for the Primer Phase even without the need for mechanical ventilation. As the project moves forward a Fire & Life Safety Task force is proposed to ensure all safety issues are developed to the satisfaction of Amtrak, MTA, FDNY and NYPD.
14	All	Rich Mohlenhoff (Environmental)	Any clearances must be approved by Amtrak.	HNTB	Noted.
15	General	Charles Szovati (Track/Civil)	The developer must coordinate its work with other projects either planned or on-going: AMTRAK's East River Tunnel reconstruction project, MTA Penn Station Access Project and MTA East Side Access Project.	PAU/EDC	All future work will include an established process for coordination with Amtrak and MTA to streamline integration with rail capital projects.
16	General	Charles Szovati (Track/Civil)	In general, minimum lateral clearance is 18 feet. Design must comply with Amtrak Standard Plan 70050.001.08. All proposed clearances must be approved by Amtrak Clearances Department [Clearances]	HNTB	Noted.
17	General	Charles Szovati (Track/Civil)	The design for any proposed changes to track alignment or profile must comply with Amtrak Specification 63.	HNTB	Noted.
18	General	Charles Szovati (Track/Civil)	It is not clear how the project will manage stormwater runoff from the proposed deck structure. Amtrak will not accept stormwater discharge onto its property.	Langan	Memos 3e and 3f indicate preliminary approaches to stormwater management. As the design progresses this will be further clarified for Amtrak review.
19	General	Charles Szovati (Track/Civil)	A typical section for each of the four locations may also be beneficial.	HNTB	As the design progresses further plans and sections will be provided.

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
20	General	Thomas Horan	All signal equipment to be relocated must be reviewed by the division engineer. The division will contact John Mariotti, Sr. Manager Engineering, Signal Design and Standards for support in the design phase.	HNTB	Noted.
↓ COMMENTS MADE ON 07/17/18 & 06/25/19 REGARDING THE SSY MATER PLAN & CONSTRUCTABILITY ANALYSIS THAT APPLY TO THE PRIMER PHASE ↓					
1		Bruno / Structures	**07/17/18 Comment:** Clarify how AREMA train impact standards are being applied to the column design.	TT	Impact loading as defined by the AREMA train impact standards has been included in load combinations provided by ASCE 7, as referenced by the 2014 NYCBC.
2		Bruno / Structures	**07/17/18 Comment:** What will construction activities (contractor access, laydown area, etc) of overbuild have on Amtrak operations? Consider Amtrak's ability (manpower) for construction support.	TT	Laydown areas and associated construction activities will be coordinated with Amtrak during future phases of the project development once contractors and project developers are involved.
3		Bruno / Structures	**07/17/18 Comment:** Clarify responsibilities and procedures properly dealing with excavated/disturbed fill presently in SSY.	Langan	Management of excavated/disturbed fill is the responsibility of the contractor performing the work, in accordance with the NYS DEC approved work plan.
4		Bruno / Structures	**06/25/19 Comment:** Portions of the ROW within SSY are planned to be used as staging/laydown areas to facilitate construction work for future Amtrak Projects. Amtrak work and required space for project support should be prioritized for Amtrak's infrastructure improvement projects. Furthermore the proposed overbuild should coordinate with ongoing and/or future projects in/around the SSY area.	HNTB	Noted.
5		Bruno / Structures	**Epanding on Comment 15:** East River Tunnels 1 & 2 Reconstruction Project is in development and will require yard-wide civil works (from Portals 1 and 2 to potentially Sub 44). Work will include new manholes and underground duct banks. The space for these utilities and the area to perform the work must be preserved and clear of proposed overbuild foundations. Further coordination with Amtrak is required, locations to be developed in FY20.	HNTB	Noted.
6		Bruno / Structures	**Epanding on Comment 15:** East River Tunnels 1 & 2 Reconstruction Project is in development and will require yard-wide preparatory track work that will restore, upgrade or reconfigure several yard track layouts potentially including: Reverse signalnig of the Sunnyside Yard Loop Tracks, Sub 3 to Line 4 Connections Upgrade, Sub 4 to Line 2 Connection Upgrade, Sub 1 & Sub 2 to Line 2 Upgrade. This preparatory work may impact the proposed foundation/column layout. Further coordination with Amtrak is required.	HNTB	Noted.

SSY Master Plan - COMMENT RESPONSE FORM

SUBMITTAL REVIEW COMMENTS / RESPONSES			
DOCUMENT NAME and REVISION NUMBER:	NYCEDC Sunnyside Yard Master Plan: Conceputal Design and Preliminary Design for Primer phase	**NYCEDC COORDINATOR:**	
REVIEWER'S NAME(S):	Structures, C&S, CM, Clearances	**DEPARTMENT:**	
REVIEWER'S ORG/DEPT:	Amtrak Engineering	**DATE RECEIVED:**	
REVIEW DATE:	10.25.2019	**DATE DUE:**	

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
1	General	Glenn Edwards (C&S)	•All underground utilities, cable, and facilities must be located and protected before any excavating, drilling, boring/directional drilling, ground penetrating activities, or construction takes place. This includes railroad and commercial utilities, cables, duct lines, and facilities. These activities will not be performed in close proximity to the Amtrak duct lines unless monitored by on-site Amtrak communications and signal (C&S) department personnel. Hand digging may be required, as directed by Amtrak through the on-site Amtrak C&S support personnel. Amtrak maintains the right to access all existing cables and conduits throughout construction. Amtrak also reserves the right to upgrade and install new cables and conduits in the affected area. The call before you dig 811 "one-call" process must be followed. Please note that Amtrak is not a part of the one-call process; contact Amtrak engineering to have all Amtrak underground utilities and assets located. If requested by Amtrak, existing depths of utilities being crossed must be verified through test pits performed by the contractor personnel. Hand digging may be required. Precautions must be taken to prevent any interruption to Amtrak's operation.	HNTB	Noted. This should go in the Division 1 Specs and on Notes page on future design drawings. Currently this information exists on the primer phase drawings from HNTB.
2	General	Glenn Edwards (C&S)	•Amtrak C&S personnel must field-verify that there is no signal equipment in the way of the project and that signal preview is not being obstructed.	HNTB	Noted. This should go in the Division 1 Specs and on Notes page on future design drawings.
3	General	Glenn Edwards (C&S)	New Structures cannot block preview to a signal.	HNTB	Noted. This should go in the Division 1 Specs and on Notes page on future design drawings.
4	General	Glenn Edwards (C&S)	•All signal equipment to be relocated must be reviewed by the division engineer. The division will contact John Mariotti, Sr. Manager Engineering, Signal Design and Standards for support in the design phase.	HNTB	Noted. This should go in the Division 1 Specs and on Notes page on future design drawings.

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
5	General	Glenn Edwards (C&S)	If work shall be done on Amtrak property that involves heavy trucks, equipment, or machinery along the right of way, duct lines and pull boxes shall be inspected to insure they can withhold the appropriate weight. Refer to tier table document.	HNTB	Noted. Future Design Basis Document/ Future drawings can call for this protection. Future design teams will need a copy of the tier table document.
6	General	Glenn Edwards (C&S)	•Signal preview must not be obstructed. Consultants performing work for Amtrak or on Amtrak property must show that there is adequate signal preview. In addition, all temporary structures, formwork, equipment, etc. Must comply during construction	HNTB	Noted. Language added in 3E memo.
7	General	Glenn Edwards (C&S)	Rails must be protected against debris. Rust, sand, metal shavings or other material can interfere with the proper shunting sensitivity of the track circuit.	HNTB/TT	Noted. This can be inserted in Division 1 Specs and Construction Agreements.
8	Task 3E Memo	Tom Bruno (Structures)	•While Structures agrees with the verbiage comprising this report it reserves the right for further review and comment on future submission when more information becomes available.	TT/PAU	Noted.
9	Task 3E Memo	Tom Bruno (Structures)	When selecting the appropriate structural members and floor system considerations shall be given to ventilation and joint impacts. An effort shall be made to minimize the number of joints in the structure to limits the potential location for water intrusion in the yard below.	TT/PAU	Noted.
10	Task 3E Memo	Tom Bruno (Structures)	4.0 Stormwater Management Section – While the approach seems appropriate please include an evaluation of the adequacy of the current drainage infrastructure within SSY with the proposed conditions. For resiliency please consider the installation of pump stations with SSY to deal with any potential future water infiltration.	TT/PAU	Noted.
11	Task 3E Memo	Tom Bruno (Structures)	Please explicitly outline the maintenance responsibilities of the overbuild structure, including: lighting, ventilation, water proofing, building joints at property boundaries, utilities etc. Special attention should be given to the maintenance responsibilities of joints abutting city streets.	TT/PAU	Noted. This will be addressed in Design Development.
12	Task 3E Memo	Tom Bruno (Structures)	Where applicable, all utilities included in subsection 4.02 Utility Routing must adhere to Amtrak's Engineering Practice 3005.	Langan	Noted. This can be inserted in Division 1/Division 33 Specs and Construction Agreements.
13	Task 3E Memo	Tom Bruno (Structures)	As discussed in subsection 4.02 Utility Routing please refrain from tying the overbuild structure's stormwater drainage into SSY's existing (2) 48" diameter storm sewers. Amtrak would prefer to keep both systems separate for the time being.	Langan/Dharam	Noted.
14	Task 3E Memo	Tom Bruno (Structures)	For subsection 5.02 Security and Blast Resistant Design, further coordination is needed with Amtrak Engineer, Risk Management and Police Departments.	TT	Noted. This will be added to the write-up for future coordination requirements
15	Task 3E Memo	Tom Bruno (Structures)	•Regarding subsection 6.03 Fire and Life Safety Requirements, it should be noted that depending on the limits of the proposed overbuild and it's proximity to the East River Tunnel portals the ventilation system may have to work in tandem with the existing East River Tunnels ventilation system.	HNTB	Noted. Current decking does not come close to East River Tunnels, but if the design limits changes this is understood.
16	Task 3E Memo	Tom Bruno (Structures)	The limits of the overbuild shall incorporate a curved pedestrian fence meeting Amtrak's Standard Drawing SP3002 and ET-1446-D where applicable.	HNTB	Noted. Future Design Basis Document/ Future drawings can call for this protection.

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
17	Task 3F Memo	Tom Bruno (Structures)	While Structures agrees with the verbiage comprising this report it reserves the right for further review and comment on future submission when more information becomes available.	TT/PAU	Noted.
18	Task 3F Memo	Tom Bruno (Structures)	When selecting the appropriate structural members and floor system considerations shall be given to ventilation and joint impacts. An effort shall be made to minimize the number of joints in the structure to limits the potential location for water intrusion in the yard below.	TT/PAU	Noted.
19	Task 3F Memo	Tom Bruno (Structures)	Please explicitly outline the maintenance responsibilities of the overbuild structure, including: lighting, ventilation, water proofing, building joints at property boundaries, utilities etc. Special attention should be given to the maintenance responsibilities of joints abutting city streets.	TT/PAU	Noted. Maintenance responsibilities will need to be determined as each phase is constructed. Amtrak will have representation no matter the process in order to streamline ongoing coordination.
20	Task 3F Memo	Tom Bruno (Structures)	Where applicable, all utilities included in subsection 4.02 Utility Routing must adhere to Amtrak's Engineering Practice 3005.	Langan	Noted. This can be inserted in Division 1/Division 33 Specs and Construction Agreements.
21	Task 3F Memo	Tom Bruno (Structures)	As discussed in subsection 4.02 Utility Routing please refrain from tying the overbuild structure's stormwater drainage into SSY's existing (2) 48" diameter storm sewers. Amtrak would prefer to keep both systems separate for the time being.	Langan/Dharam	Noted. Dharam have included allowances for pump stations within the cost model
22	Task 3F Memo	Tom Bruno (Structures)	The limits of the primer phase overbuild shall incorporate a curved pedestrian fence meeting Amtrak's Standard Drawing SP3002 and ET-1446-D where applicable.	HNTB	Noted.
23	Task 3F Memo	Tom Bruno (Structures)	Amtrak prefers the alternate option depicted on S-499 whereas the space below the Skillman Ave portion can be utilized for future yard operations and maintenance activities.	(TT/PAU)	Noted.
24	General	Michael Cooley (CM)	Coordination of project activities including use of space for laydown and staging, track outages and other resources. East River Tunnel Rehabiltation and Gateway may be ongoing in this same time frame and it should be made clear that these projects take precedence. Make clear in the developer agreement that very limited site storage is available for stage equipment and materials.	HNTB	Noted. Will get covered in construction agreements
25	General	Michael Cooley (CM)	Create master schedule during design phase detailing every activity that requires track outages so a realistic estimate of track time available can be given to the developer.	HNTB	Noted, this will be tied to construction agreements.
26	General	Michael Cooley (CM)	Develop estimate for Force Account resources required including LIRR resources in early stages of design.	HNTB/Dharam	Noted. Master plan started preliminary force account estimates. As the design progresses these preliminary estimates will evolve. Dharam and HNTB have developed a preliminary force account cost model based upon an assumed duration driven by an assumed $10M monthly construction spend
27	General	Michael Cooley (CM)	Ensure that final yard configuration includes sufficient laydown area for normal Amtrak operartions.	HNTB	Noted. Amtrak design approvals as project progresses will ensure Amtrak operations are not impeded.
28	General	Michael Cooley (CM)	Ensure participation of Amtrak operating groups during design.	HNTB	Noted.
29	General	Michael Cooley (CM)	Ensure that employee cirulation within the yard area is maintained.	HNTB/PAU	Noted. The team is working on revised access points for review and approval by Amtrak.
30	General	Michael Cooley (CM)	Design ventilation and power systems etc. to handle potential future increase in yard use and traffic.	HNTB	Noted. Current design takes into consideration the Amtrak MP. As that MP evolves the design team will need to adjust.

No.	Sect # or Dwg #	Reviewer's Name / Org-Dept	Comment	Responder	Response
31	General	Kaven Casey (Clearances, inspections & tests)	Amtrak concerns with horizontal clearances would be formulated. The process for determining horizontal clearances is that is has to be calculated using the Amtrak Standard 70050.001.08 which stipulates that the clearances must be compensated by 1 ½" per degree of curvature. In addition, the inside clearance for super elevated track should be further increased by 1" for each inch of super elevation for each 5' (feet) of height above top of the low rail. These compensations should be determined using the existing track(s) and the proposed structures as the basis for the calculations and not using the dynamic tendencies of a "standard car", as shown in the Bentley Rail-Track, to dictate clearances.	HNTB	Agreed. This text can be integrated into the current report and future Basis of Design reports.